

1

21190
608

172

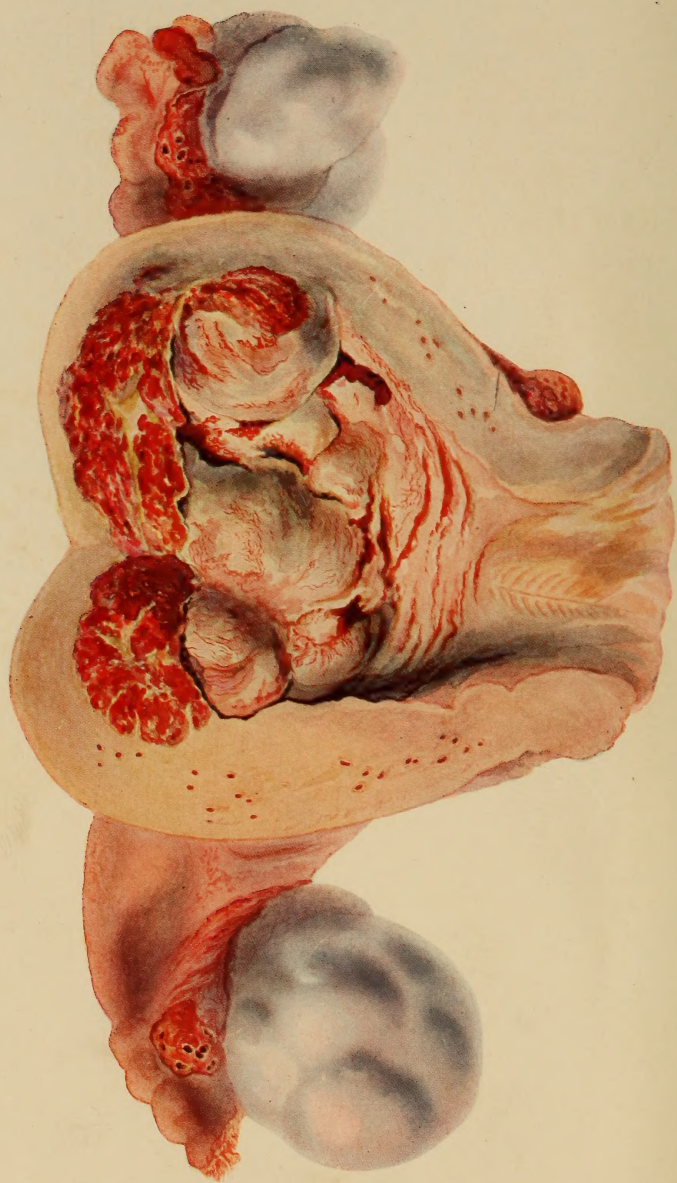


FIG. 339.—Chorioepithelioma of the fundus.

GYNECOLOGY

BY

BROOKE M. ANSPACH, M.D.

ASSOCIATE IN GYNECOLOGY, UNIVERSITY OF PENNSYLVANIA

WITH AN INTRODUCTION BY

JOHN G. CLARK

526 ILLUSTRATIONS



PHILADELPHIA AND LONDON
J. B. LIPPINCOTT COMPANY

RG101
A5

COPYRIGHT, 1921, BY J. B. LIPPINCOTT COMPANY

*Electrotyped and Printed by J. B. Lippincott Company
The Washington Square Press, Philadelphia, U. S. A.*

APR 18 1921

©CL A611682

no 1

TO
JOHN G. CLARK, M.D.
PROFESSOR OF GYNECOLOGY
UNIVERSITY OF PENNSYLVANIA

PREFACE

GYNECOLOGY is to-day so broad a subject that in order to deal with it exhaustively a series of monographs would be required. While monographs undoubtedly enrich the literature and are invaluable, they do not altogether meet the needs of either the student or the practitioner of medicine, for in order to cover the necessary ground the student must of necessity be a voluminous reader, and he would be unusually discerning indeed if he were capable of selecting the pertinent from the unessential or the immaterial. The monograph, moreover, does not furnish the needed information in such a form as to enable the practitioner to gather his facts with a reasonable expenditure of time.

There would seem to be, therefore, a distinct place for the text-book which presents the subject in a systematic form, giving all the necessary information, and omitting such details as are not immediately required for practical purposes. A thorough acquaintance with the subject presented in this way will provide the student with a fund of information that clinical teaching and clinical experience will tend to crystallize and render applicable. In the library of the busy general practitioner the comprehensive text-book stands as a ready guide to the accurate diagnosis and the successful treatment of the gynecologic conditions most frequently encountered.

A logical plan for studying the pathology of any organ or group of organs and of the methods of treatment may be formulated to include: (1) A description of the normal structures and of the normal functions; (2) a review of the causes that produce the abnormal; and (3) a summary of the manifestations of the abnormal and of the methods of treatment. Believing this to be a rational sequence, the author has arranged and discussed the subject matter in the following order: (1) Normal anatomy and physiology; (2) morbid anatomy and physiologic abnormalities that are dependent upon developmental defects; (3) the acquired causes of disease of the reproductive organs; (4) the general symptomatology, both subjective and objective, of diseases peculiar to the pelvic organs, together with the approved methods of investigation; and finally (5) a systematic arrangement and description of the diseases affecting the organs and structures of the entire generative tract—their morbid anatomy, symptomatology, diagnosis and treatment.

In addition to affections of the generative organs proper, such diseases of the intestinal and urinary tract as are most frequently encountered in women have been considered. Static backache, sacroiliac sprain, toxic arthritis, gonorrhœa, tuberculosis, syphilis, menstrual disorders, sterility, the selection and preparation of operative cases, operative technic, post-operative treatment, and the management of post-operative complications, local therapeutic measures, radium and Röntgen ray therapy, and the use of vaccines, have been dealt with under separate heads.

Although seemingly superfluous in a work of this nature, the chapters on anatomy and physiology have been included in the belief that they will

serve to refresh the memory of the student and of the practitioner regarding the details of anatomy and physiology of the generative organs, a knowledge of which is so essential to a full understanding of gynecologic symptoms and operative treatment, and which will render unnecessary a search through the more exhaustive treatises devoted exclusively to these subjects.

The author has drawn freely from the literature, and has aimed to give full credit for these quotations in the bibliographic references at the end of each chapter. The bibliography is intended to serve the student as a guide for more extended reading. Some of the earlier writings of the author have also been included. The majority of the illustrations have been made from original photographs or drawings.

The author wishes to acknowledge his indebtedness to Dr. John G. Clark for the clinical and teaching experience that facilitated the preparation of this volume. He is under especial obligations also to Dr. Philip F. Williams, who has reviewed the entire manuscript, criticising, correcting, and adding to the text, and assisting in many ways too numerous to mention. The suggestions of Dr. Charles C. Norris in the chapter on tuberculosis, of Dr. Frank Crozier Knowles in the chapter dealing with cutaneous lesions of the external genitalia, and of Dr. Floyd E. Keene in the chapter on examination of the urinary tract, have been most acceptable; Dr. Wm. J. Merrill and Dr. Frank Dickson have given assistance in the preparation of the chapter on backache; Dr. Leon Jonas, in the section on acidosis; and Dr. Henry Pancoast, in the chapter on radium treatment and Röntgen ray therapy.

The author's thanks are also due to the artists, particularly Mr. Aitken, for the excellence of their work; to the publishers, for their unfailing courtesy; to Miss Lilian B. Mendel, for careful editorial work; and to Miss Lydia Stieglitz, for her painstaking efforts in typing the manuscript.

THE AUTHOR.

JANUARY, 1921.

CONTENTS

CHAPTER

PAGE

I. EMBRYOLOGY.....	I
Embryologic Structures: Wolffian Body and Wolffian Duct, Müllerian Duct, Sexual Gland. Foetal Structures: Ovary, Uterus, Tubes, Vagina, External Genitalia, Bladder and Urethra, Rectum, Ureter and Kidney. Generative Organs at Birth and During Childhood: Ovary, Uterus, Tube, Vagina. Embryonic Rests and the New Formations Originating in them.	
II. DEVELOPMENTAL ANOMALIES OF THE GENERATIVE ORGANS.....	15
Morbid Anatomy: Ovary.—Absence of both; of one; rudimentary ovaries; supernumerary ovaries. Tubes.—Absence of both; of one; partial development; persistence of foetal type; supernumerary tubes; accessory ostia; diverticula. Uterus.—Complete absence; unicornis; duplex bicornis; duplex septus; bicornis; rudimentary; foetal type; infantile type; lateroposition; retroversion; retroflexion; anteflexion; stenosis of cervix. Vagina.—Complete absence; double; unilateral; atresia; septate. Hymen.—Atresia; double. Vulva.—Atresia or defectus; infantile. Bladder and Urethra.—Absence; double bladder; vesico-umbilical fistula; cyst of the urachus; epispadias; exstrophy of bladder; hypospadias. Ureter.—Duplication; absent; occlusion; abnormal communications. Kidney.—Absent; rudimentary; foetal type; horseshoe; disciform. Anus and Rectum.—Complete absence of anus; imperforate anus; abnormally situated anus; partial and complete occlusion of the rectum; abnormal communications. Pseudohermaphroditism.—Female; male. Gynatresia.—Forms; symptoms. Diagnosis: External Genitalia; Uterus and Vagina, Imperfect, Double; Gynatresia. Treatment: Atresia Labia Minora; Hypertrophy of Clitoris; Hypertrophy of Labia Minora; Hypertrophy of Prepuce; Imperforate Hymen; Rigid Hymen; Epispadias; Hypospadias; Exstrophy of Bladder; Vaginal Adhesions; Atresia Vaginae, complete, partial; Vaginal Septa; Vaginal Stenosis; Hypertrophy of Cervix; Atresia of Cervix; Stenosis of Cervix; Infantile Uterus; Bicornate or Double Uterus; Hermaphroditism; Gynatresia; Anus and Rectum.	
III. ANATOMY OF THE GENERATIVE ORGANS.....	31
Perineum: Vulva. Mons; Labia Majora; Labia Minora; Clitoris; Vestibule; Bartholin's Glands; Vestibular Bulbs. Vagina; uterus; tubes; ovaries; bladder; urethra; ureters; rectum; anus; the pelvic peritoneum; the uterine ligaments; the pelvic cellular tissue; the pelvic floor. Muscles.—Levator ani; coccygeus; pyriformis; transversus perinei; bulbo-cavernosi; external sphincter ani; internal sphincter ani. Fascia. Blood-vessels of Pelvis: Arteries.—Ovarian; internal iliac; uterine; superior vesical; inferior vesical; vaginal; superior hemorrhoidal; middle hemorrhoidal; inferior hemorrhoidal; internal pudic. Veins.—Ovarian; uterine; vesical; internal pudic; internal iliac; obturator; superior hemorrhoidal; middle hemorrhoidal; hemorrhoidal plexus; inferior hemorrhoidal. Lymphatics of Pelvis: Pelvic Lymph-nodes.—Iliac; hypogastric; sacral; inguinal. Lymphatic Radicles.—From external genitalia; from ovary; from tube; from uterus, large fundal, small fundal, lower body and cervix; from vagina, upper, middle, lower. Abdominal Wall.	
IV. PHYSIOLOGY.....	61
Reproductive Organs: Introduction.—Sexual maturity; nubility. Puberty.—Age; influences affecting; manifestations of puberty (psychical and physical); ovarian development. Functions of the Sexual Organs.—External genitalia; internal genitalia; glands of internal secretion; placenta; mammary glands. Menstruation.—Underlying impulse; phenomena of menstruation; menstrual flow; menstrual habit. Ovulation.—Rupture of follicle; corpus luteum; relation between menstruation and ovulation. Anatomic changes incident to	

ovulation and menstruation. Fecundation.—Mechanics of insemination; penetration of sperms to outer part of the tube. Nidation of the Ovum.—Decidua; chorion villi; trophoblast; intervillous blood spaces; placenta. Pregnancy.—Changes in uterus, fundus and cervix; tubes; ovaries (corpus luteum of pregnancy); vagina; abdominal wall; bladder. Labor.—Dilatation of cervix; formation of perineal gutter; dilatation of vaginal outlet; separation and expulsion of placenta; abortion or miscarriage. Puerperium.—Involution; structures involved; residua indicative of pregnancy. Menopause.—Age; changes in ovaries; nervous manifestations; premature menopause; artificial menopause. Excretions of Genitalia.—Characteristics and source. Ureters: Excretion of Urine.—Gravity, peristalsis; back flow of kidney pelvis; back flow to ureter. Bladder: Free and fixed part of bladder; mechanics of retention and expulsion; reflexes involved. Rectum: Mechanics of defecation; reflexes involved.

V. CAUSES OF PELVIC DISORDERS.....	87
Congenital: Appearing at Birth.—Gross malformations or tumors. Appearing at Puberty.—Gynatresia. Appearing During Reproductive Period.—Fibroid Tumor; sarcoma. Appearing at Menopause or After.—Ovarian tumors; carcinomata. Acquired: General Causes.—Anæmia; heart disease; mumps; tuberculosis; exanthemata of childhood; defective development; bad hygiene; depressing conditions of body and mind; unnatural sexual state; unstable nervous system. Complicating Pregnancy and Labor.—Displacements; laceration. Cause of Malignant Growth.—Factors seeming to influence the development of cancer of vulva; cancer of vagina; cancer of cervix; cancer of fundus; cancer of ovary. Infections.—Gonorrheal; puerperal; abortal. Bacteriology of Generative Tract.—Bacterial forms and peculiarities: Tuberculosis infection; gonococcus infection; streptococcus infection; staphylococcus infection.	
VI. HISTORY-TAKING AND SYMPTOMATOLOGY.....	91
History: Attitude Toward Patient in Taking the History; Form of History Record; Chief Complaint; Age and Social State; Occupation and Habits of Life; Menstrual History; Pregnancies; Labor; Abortion; Family History; General Previous History; Onset of Present Trouble. Symptomatology: Present Symptoms.—Pain; location; quality. Menstrual Symptoms.—Amenorrhœa; menorrhagia; metrorrhagia. dysmenorrhœa. Leucorrhœa.—Amount; quality. Rectal Symptoms.—Constipation. Bladder Symptoms.—Frequency of urination; time of occurrence. Gastro-intestinal Symptoms; Respiratory Symptoms; Circulatory Symptoms; Nervous Symptoms; General Health.	
VII. GENERAL PHYSICAL EXAMINATION.....	103
General Appearance; Temperature; Circulation; Pulse Rate; Examination of the Heart; Respiratory Rate; Examination of the Lungs; Examination of the Blood; Blood Count; Blood Culture; Wassermann Reaction; Abderhalden Serum Test; Complement-fixation Test for Gonorrhœa; Obtaining Blood for Serum Tests; Examination of the Urine. Bacteriologic Examination of the Urine; Recognition of Tubercle Bacillus by Guinea-pig Inoculation.	
VIII. EXAMINATION OF THE PELVIS AND ABDOMEN.....	112
General Consideration: Examination under Anæsthesia; Preparation for Examination. Positions for Pelvic and Abdominal Examination.—Dorsal; knee-chest; lithotomy; Sims'; supine; erect. Preparation of Physician's Hands.—Lubricant; gloves. Illumination.—Window; electric bulb. Instruments.—Specula, bivalve, trivalve, cylindric, rectal; vulsella; sound; dilators. Special methods of Examination.—Intrauterine digital palpation; Diagnostic Curettement and Test Excision. Smear Preparations as an aid to Diagnosis. Demonstration of Treponema Pallidum. Pelvic Examination: Inspection.—External genitalia; vagina and cervix; pelvic viscera. Palpation.—Simple digital; bimanual; bimanual with cervix pulled down; bimanual with finger in rectum; trimanual palpation. Abdominal Examination: Inspection; Palpation; Percussion; Auscultation; Mensuration; Routine Examination of Remote Abdominal Organs.	

IX. EXAMINATION OF THE URINARY ORGANS.....	138
<p>Urinalysis: Significance of constituents. Palpation: Urethra; bladder; ureter; kidney. Percussion: Limited field of usefulness. Inspection: Urethra; Urethroscopy; Bladder and Ureteral Orifices; Cystoscopy. Methods; general preliminaries. Technic of the Direct Method with Atmospheric Distention of Bladder.—Local anæsthesia; dilatation of meatus; position; removal of urine; locating fixed anatomical points; unusual appearances. Technic of the Indirect Method with Water Distention of Bladder.—Position; picture presented by normal bladder; alterations and significance thereof; in capacity of bladder; color and transparency of mucosa; number, size, and outline of vessels; shape of the vesical interior; submucous trabeculæ; position of the ureteral orifices. Catheterization of the Ureters: Technic with the Direct Method.—Preparation and introduction of catheters. Technic of the Indirect Method.—Facts determined by catheterization; examination of the ureter and kidney by means of a wax-tipped bougie; collecting urine. Röntgenographic-ray Examination of the Kidney: Diagnostic Methods Combining the Ureteral Catheterization, collargol Injection, and the Röntgenographic-ray: Bismuth Catheter; Pyelography. Estimation of the Functional Activity of the Kidneys, Combined or Separate: Chromocystoscopy.—Indigo-carmin; chromo-ureteroscopy; phenolsulphonephthalein. Blood Urea.</p>	
X. EXAMINATION OF THE ANUS AND RECTUM.....	162
<p>Preparation of Patient: Position. Inspection.—External, internal specula; Tuttle's, Kelly's, pneumatic proctoscope; appearance of healthy and of diseased bowel through the proctoscope; other useful instruments in making rectal examinations. Palpation.</p>	
XI. DISEASES OF THE EXTERNAL GENITALIA.....	166
<p>Skin Diseases.—Cutaneous diseases; herpes; parasitic diseases. Vulvar Adhesions; Vulvitis; Gangrene; Pruritus; Kraurosis Vulvæ; Elephantiasis. Venereal Sores.—Chancre; secondary syphilitic; tertiary syphilitic; chancroid; warts. Œdema; Varicose Veins; Hematoma; Hypertrophy; Carcinoma; Sarcoma; Tuberculosis; Rodent Ulcer; Fibromyoma; Lipoma; Sebaceous Cysts. Vulvovaginal Glands.—Inflammation of ducts; abscess; cyst. Injuries of the External Genitalia; Pudendal Hernia.</p>	
XII. DISEASES OF THE HYMEN AND VAGINA.....	192
<p>Hymen; Abnormal Rigidity or Elasticity of the Hymen; Cystic Tumors of the Hymen. Vagina; Vaginitis (Paravaginitis); Vaginismus. Cysts.—Fibromyoma; Sarcoma; Carcinoma; Chorioepithelioma. Foreign Bodies in Vagina; Leucorrhœa.</p>	
XIII. INJURIES TO THE PERINEUM AND THEIR RESULTS.....	200
<p>Physiology of Support of the Pelvic Floor; The Production of Injuries During Labor; Forms of Laceration and Their Result; Symptoms of Relaxed Perineum; Diagnosis; Treatment; Cystocele; Treatment.</p>	
XIV. DISEASES OF THE CERVIX.....	223
<p>Atresia, Congenital and Acquired.—Causes; symptoms; treatment. Endocervicitis, Acute and Chronic.—Causes; symptoms; treatment, palliative and radical. Cervical Polyp.—Causes; symptoms; treatment. Laceration of Cervix; Secondary Lesions.—Eversion; Nabothian cysts. Hypertrophy of Cervix; Hypertrophy of Cervix in Nulliparæ. Symptoms of Lacerated Cervix.—Of simple; of complicated lacerations. Treatment of Lacerated Cervix; Indications for Operation; Preparatory Local Treatment; Choice of Operation; Trachelorrhaphy; Trachelectomy.</p>	
XV. CHANGES IN FORM AND POSITION OF THE UTERUS.....	237
<p>Normal Flexion and Position.—Relations of axis of body to the axis of the cervix; normal flexion and position; exaggerated flexion in ill-developed stenotic cervix; subnormal flexion in chronic metritis. Pathologic Flexions and Positions.—Retroflexion; retroposition; latero-position and flexion; ante-position in chronic metritis; descensus;</p>	

prolapse; changes in the axis of the uterus in relation to that of the vagina, preceding downward displacement; elevation of the uterus. Pathologic ante flexion; Varieties; Symptoms. Treatment.—Forcible dilatation; Dudley's operation; Pozzi's operation; Wylie's drain; Norris drain; Metranoikter. Retroflexion and Retroversion; Causes; Pathology; Symptoms. Treatment.—Replacing uterus, use of pessary; operations, discussion of choice; technic of Alexander, ventro-suspension, ventral fixation; Coffey's operation; Webster-Baldy operation; Simpson's operation; shortening utero-sacral ligaments. Descensus of Uterus and Prolapse; Mechanics and Etiology; Accompanying Lesions; Diagnosis. Treatment.—Pessaries, choice of operation; technic of vaginal fixation; Watkin's operation; supra-vaginal hysterectomy and fixation of stump. Ante position; Elevatio Uteri; Torsion; Causes and Associated Conditions. Inversion.—Causes; symptoms; treatment.

XVI. DISEASES OF THE ENDOMETRIUM AND MYOMETRIUM. 277

Endometritis. Acute.—Causes; symptoms; diagnosis; treatment. Chronic.—Causes; conditions erroneously called chronic endometritis; symptoms; diagnosis; treatment. Endometrial Polyp.—Pathology; symptoms; treatment. Metritis. Acute.—Symptoms; treatment. Chronic.—Symptoms; diagnosis; treatment. Subinvolution.—Pathology; symptoms; treatment. Hyperinvolution.—Symptoms; treatment. Perforation of the Uterus.—Causes; pathology; symptoms; treatment. Hematometra, Physometra, Pyometra.—Causes; symptoms; treatment. Curettement, Curative and Diagnostic.

XVII. MYOMATA OF THE UTERUS; ADENOMYOMA. 292

Etiology and Histology: Vascularization of Myomata. Capsule, Number, Shape, Consistency; Situation.—Interstitial, Submucous, Subperitoneal. Migration of Myomata; Parasitic Tumors; Intraligamentous Myomata; Retroperitoneal; Subvesical. Growth; Disappearance. Pathology: Effect of Myomata on the Uterine Cavity and Wall; Effect of Myomata on the Appendages; Effect of Myomata on Bladder, Urethra, Ureters and Rectum; Effect of Myomata on Cardio-vascular System; Degenerations of Myomata. Symptoms.—Frequency; age of occurrence; race; hemorrhage; pain; leucorrhœa; anæmia. Diagnosis.—Abdominal examination; bimanual palpation; submucous; interstitial; subperitoneal. Differential Diagnosis.—Ovarian cyst; pregnancy. Treatment.—Palliative, Radical.—Choice of operation; myomectomy; abdominal; vaginal; hysteromyomectomy; pan-hysterectomy for myomata. Adenomyomata: Histology and Etiology; Pathology; Symptoms and Diagnosis; Treatment.

XVIII. MALIGNANT TUMORS OF THE UTERUS 330

Carcinoma of the Uterus.—Situation; etiology. Carcinoma of the Cervix.—Pathology; symptoms; diagnosis; treatment; prognosis; the question of operability; treatment of inoperable cases; recurrence of carcinoma after operation. Carcinoma of the Body of the Uterus.—Pathology; symptoms; prognosis; treatment. Sarcoma of the Uterus.—Pathology; symptoms; diagnosis; treatment. Chorioepithelioma.—Pathology; symptoms; diagnosis; prognosis; treatment. Panhysterectomy for Malignant Tumors of the Cervix; Vaginal Hysterectomy for Malignant Tumors of the Cervix (Simple); Vaginal Hysterectomy for Malignant Tumors of the Cervix with Paravaginal Incision; Curettement and Cauterization; High Amputation for Malignant Tumors of the Cervix with the Cautery Knife.

XIX. DISEASES OF THE FALLOPIAN TUBES. 359

Inflammatory Disease. Salpingitis.—Etiology; pathology. Endosalpingitis; Perisalpingitis; Interstitial Salpingitis; End Results of Endosalpingitis; Pyosalpinx; Tubo-ovarian Abscess; End Results of Perisalpingitis; Hydrosalpinx; Tubo-ovarian Cyst; Hematosalpinx; New Formations of the Tube; Polyps; Papillomata; Cysts of the Tubes; Myomata; Embryomata; Carcinoma; Symptoms, Diagnosis and Treatment of Affections of the Fallopian Tubes. Accidents Affecting Tubal Enlargements.—Rupture of pyosalpinx; rupture of hydro-

saipinx; torsion of tubal enlargements; treatment. Extrauterine Pregnancy.—Etiology; varieties of extrauterine pregnancy; pathology. Nidation of Ectopic Ovum; Tubal Abortion and Tubal Rupture; Fate of the Ovum; Abdominal Pregnancy; Hemorrhage; Pelvic Hematocele; Free Intraperitoneal Hemorrhage; Uterine Changes in Extrauterine Pregnancy; Fate of the Pregnant Tube; Symptoms Previous to Tubal Rupture or Abortion; Symptoms at the Time of Rupture or Abortion; Symptoms Following Rupture or Abortion in Case of Abdominal Pregnancy; Prognosis; Diagnosis before Rupture; at Rupture or Abortion; Hematocele Formation; Abdominal Pregnancy; Treatment.

XX. DISEASES OF THE OVARIES 381

Inflammation: Acute Interstitial Oöphoritis.—Etiology; pathology. Acute Perioöphoritis.—Etiology; pathology; end result of acute interstitial oöphoritis; end result of acute perioöphoritis; symptoms, diagnosis's, and treatment of inflammatory diseases of the ovaries. Chronic Oöphoritis; Tumors of the Ovary; Epithelial; New Growths. Glandular Cysts (Adenocystoma).—Etiology; pathology; symptoms; diagnosis. Parovarian Cysts.—Etiology; pathology; symptoms; diagnosis. Papillomatous Cysts.—Etiology; pathology; symptoms; diagnosis. Carcinoma of the Ovary.—Etiology; pathology; symptoms; diagnosis. Connective Tissue New Growths: Fibromata, Fibromyomata.—Pathology; symptoms; diagnosis. Sarcomata.—Pathology; symptoms; diagnosis. Combined Epithelial and Connective Tissue New Growths: Dermoid Cysts of the Ovary.—Etiology; pathology; symptoms; diagnosis. Treatment of Ovarian New Growths. Cystomata.—Uncomplicated glandular cystomata of the ovary; intraligamentous cysts; papillomatous cysts; cystoma complicating pregnancy. Carcinomata; Fibromata; Sarcomata. Retention Cysts of the Ovary. Graafian Follicle Cysts.—Etiology. Hydrops Folliculi.—Etiology. Corpus Luteum Cysts.—Etiology; symptoms, diagnosis, and treatment of retention cysts. Compound theca-lutein cysts of the ovary. Accidents and Complications of Ovarian Tumors: Infection.—Etiology; symptoms; diagnosis. Torsion.—Etiology; symptoms; diagnosis. Rupture.—Etiology; symptoms; diagnosis. Malignant Degeneration.—Symptoms; diagnosis; treatment of accidents and complications of ovarian tumors. Atrophy of the Ovary; Hypertrophy of the Ovary; Hernia of the Ovary. Prolapse of the Ovary.—Cause; symptoms; diagnosis; treatment.

XXI. PELVIC INFLAMMATORY DISEASE 411

Pelvic Inflammatory Disease.—Classification; etiology; pathology. Gonorrhœal Pelvic Inflammatory Disease.—Etiology; pathology; symptoms; treatment. Puerperal Pelvic Inflammatory Disease.—Etiology; pathology; symptoms; diagnosis; prognosis; end results; treatment. Instrumental or Post-operative Pelvic Inflammatory Disease.—Etiology; pathology; symptoms; treatment. Pelvic Abscess.—Definition; treatment. Chronic Pelvic Inflammatory Disease.—Etiology; pathology; symptoms; diagnosis; treatment. Cellulitis.—Etiology; pathology; symptoms; diagnosis; treatment. Chronic Pelvic Cellulitis.—Symptoms; diagnosis; treatment. Pelvic Hematoma.—Etiology; pathology; symptoms; diagnosis; prognosis; treatment. Hysterectomy for Pelvic Inflammatory Disease; Salpingo-oöphorectomy; Salpingectomy; Salpingostomy; Vaginal Incision and Drainage.

XXII. DISEASES OF THE URETHRA 440

Urethritis.—Causes. Acute.—Symptoms; diagnosis; prognosis; treatment. Chronic. Suburethral Abscess.—Cause; symptoms; treatment. Fissure of Urethra.—Cause; symptoms; diagnosis; treatment. Prolapse of Urethral Mucosa.—Cause; symptoms; treatment. Dilatation of Urethra.—Cause; symptoms; treatment. Stricture of Urethra.—Cause; symptoms; diagnosis; treatment. Urethral Caruncle.—Symptoms; treatment. New Growths of Urethra.

XXIII. DISEASES OF THE BLADDER.....	453
Cystitis. Acute Cystitis.—Etiology; symptoms; diagnosis; treatment; prognosis. Chronic Cystitis.—Etiology; symptoms; diagnosis; treatment. Tuberculous Cystitis.—Etiology; symptoms; diagnosis; treatment. Vesical Calculus.—Etiology; symptoms; diagnosis; treatment. Hunner Type of Bladder Ulcer in Women. New Growths of the Bladder: Papilloma.—Symptoms; diagnosis; treatment.	
XXIV. URINARY FISTULA.....	463
Site and Varieties. Urogenital Fistula.—Etiology; symptoms; diagnosis. Treatment.—Vaginal operations; extraperitoneal abdominal operations; nephrectomy.	
XXV. DISEASES OF THE KIDNEY AND URETER.....	469
Diseases of the Kidney. Ptosis; Abnormally Movable Kidney.—Etiology; symptoms; diagnosis; treatment. Hydronephrosis.—Congenital, acquired; etiology; symptoms; diagnosis; differential diagnosis; treatment. Pyelonephritis, Pyelonephrosis, Empyema of the Kidney Pelvis and Kidney Abscess.—Etiology; symptoms; diagnosis; treatment. Tuberculosis of the Kidney.—Etiology; pathology; symptoms; diagnosis; treatment; prognosis. Renal Calculus.—Etiology; symptoms; diagnosis; treatment. Tumors of the Kidney.—Nature; symptoms; diagnosis; treatment. Cystic Tumors of the Kidney; Polycystic Disease of the Kidney; Adenocystoma; Adrenal Tumors; Pararenal Tumors; Kidney Operations; Nephropexy; Nephrotomy; Nephrolithotomy; Nephrectomy. Pyelitis.—Acute, chronic, etiology; symptoms; diagnosis; prognosis; treatment. Diseases of the Ureter. Inflammation.—Symptoms; diagnosis; treatment. Ureteral Calculus.—Symptoms; diagnosis; treatment; operative treatment; stone in the upper ureter; stone in the pelvic brim; stone on the pelvic floor; stone in the vesical portion of the ureter; stone in the intraparietal ureter. Stricture of the Ureter.—Etiology; symptoms; pathology; diagnosis; treatment. Obstruction of the Ureter.—Symptoms; treatment. Ureteral Fistula; Ureteral Ligation; Ureteral Tear or Injury.	
XXVI. DISEASES OF THE ABDOMINAL VISCERA RELATED TO, OR ASSOCIATED WITH, PELVIC DISORDERS.....	500
Introduction. Appendicitis.—Involvement of appendix in pelvic disease; varieties of appendicitis. Acute Appendicitis.—Symptoms; diagnosis; differential diagnosis between acute appendicitis and acute adnexitis; history; symptoms; physical signs; course of the symptoms; treatment. Chronic Appendicitis.—Symptoms and diagnosis; differential diagnosis between chronic appendicitis and chronic adnexitis; treatment. Appendicectomy.—Interval operation; operation in acute cases: (a) Unruptured; (b) perforated appendix with spreading peritonitis; (c) appendicial abscess. Intestinal Stasis.—Acute, chronic. Varieties.—Chronic intestinal stasis from pelvic disease; chronic intestinal stasis from enteroptosis; chronic intestinal stasis from adhesions between intestinal loops or between the intestine and the parietal peritoneum or the mesenteries or omentum; chronic intestinal stasis from redundancy and overdistention of the colon; symptoms; diagnosis. Treatment.—Gastropexy; colonopexy; release of adhesions; short-circuiting by intestinal anastomosis; resection of intestine; contraction or expansion of the abdomen. Diverticulitis.—Etiology, symptoms; treatment.	
XXVII. DISEASES OF THE ANUS AND RECTUM.....	522
Fissure in Ano.—Etiology; symptoms; diagnosis; treatment; division of the sphincter; operation for fissure in ano. Fistula in Ano.—Etiology; symptoms; diagnosis; treatment; operation for fistula in ano. Pruritus Ani.—Etiology; symptoms; diagnosis; treatment. Hemorrhoids.—Etiology; symptoms; diagnosis; treatment; operative treatment. Prolapse of the Rectum.—Etiology; varieties; symptoms; diagnosis; treatment. Tumors of the Rectum. Polyps.—Etiology;	

symptoms; diagnosis; treatment. Carcinoma of the Rectum.—Location; etiology; symptoms; diagnosis; treatment. Stricture of the Rectum.—Etiology; symptoms; diagnosis; treatment.

XXVIII. BACKACHE.....	536
Introduction; Mechanics of Equilibrium. Static Backache.—Etiology; symptoms; diagnosis; normal type; kangaroo type; gorilla type; differential diagnosis; treatment; orthopedic treatment; mechanical treatment; gorilla type. Sacroiliac Sprain.—Etiology; symptoms; examination; diagnosis; treatment; prognosis. Toxic Arthritis; Pendulous Fat Abdomen, Relaxed Abdominal Wall. Coccygodynia.—Etiology; symptoms; diagnosis; treatment.	
XXIX. GONORRHOEA.....	554
General Peculiarities; Latent and Residual Gonorrhœa; Symptoms; Diagnosis; Technic of the Preparation and the Examination of Smears for the Gonococcus; Prognosis; Prophylaxis; Treatment of the Acute Initial Stage.	
XXX. TUBERCULOSIS OF THE GENERATIVE ORGANS.....	560
General Considerations; Incidence. Tubal Tuberculosis.—Symptoms; treatment. Tuberculosis of the Peritoneum.—Pathology; symptoms; treatment. Tuberculosis of the Endometrium.—Symptoms; treatment. Tuberculosis of the Ovary; Tuberculosis of the Cervix; Tuberculosis of the Vagina; Tuberculosis of the vulva.	
XXXI. SYPHILIS OF THE GENERATIVE ORGANS.....	569
General Considerations; Mode of Infection; Pathology; Syphilis of the Vulva; Syphilis of the Vagina; Syphilis of the Cervix; Syphilis of the Uterus; Syphilis of the Tube; Syphilis of the Ovary; Syphilis of the Cellular Tissue; Diagnosis of Syphilis of the Generative Tract in Women; Differential Diagnosis of Syphilitic Lesions of the Cervix; Prognosis of Syphilitic Conditions of the Generative Tract in Women; Treatment.	
XXXII. DISORDERS OF MENSTRUATION.....	579
Precocious Menstruation; Delayed Menstruation; Vicarious Menstruation; Amenorrhœa; Anatomical Defects Producing Amenorrhœa; Constitutional Diseases Producing Amenorrhœa; Psychic Influences Producing Amenorrhœa; Menorrhagia; Metrorrhagia; Dysmenorrhœa; Dysmenorrhœa Due to Developmental Defects; Dysmenorrhœa Due to Acquired Lesions; Interval Dysmenorrhœa; Treatment of Dysmenorrhœa; Membranous Dysmenorrhœa; Menopause; Premature Menopause.	
XXXIII. STERILITY.....	598
Etiology; Imperfect Development of Genital Organs; Acquired Diseases; Functional Defects. Diagnosis.—Hühner's method. Treatment.—Ovarian transplantation; artificial insemination.	
XXXIV. HYGIENE AND THE RELATION BETWEEN NERVOUS AND GYNECOLOGIC DISORDERS.....	609
The Hygiene of Adolescence; The Relation of Neuroses to Pelvic Disease; Insanity in Its Relation to Gynecology.	
XXXV. THE SELECTION AND PREPARATION OF PATIENTS FOR OPERATION.....	613
The Selection of Cases; The Examination and Treatment of Patients Preparatory to Operation; Cardiac Risks; Anæmia Risks; Blood-pressure Risks; Crile's Anoci Association; Kidney Risks.	
XXXVI. OPERATIVE TECHNIC.....	620
General Preparation of the Patient. Preparation of the Operative Area.—Perineal operations; abdominal sections. Preparations of the Operator and Assistants; Preparation of Dressings and Utensils; Preparation of the Operating Room and Furniture; Preparation of Wash-Water; Preparation of Instruments; Ventilation and Lighting; Some General Points in Operative Technic to be Observed During the Operation. The Abdominal Incision.—Low paramedian celiotomy	

incision; right or left lateral celiotomy incision; high paramedian celiotomy incision; transverse suprapubic incision; gridiron incision. Kidney Incisions.—Kelly's incision; Mayo's incision for lumbar exposure of the kidney; Israel's incision; Mayo-Robson's incision. Directions Regarding All Incisions; Isolation and Exposure of the Operative Area; Exploration of the Abdomen; Hemostasis; Adhesions; Wounds of the Viscera; Ligation of the Ureters; Treatment of Surfaces Denuded as the Result of Separation of Adhesions; Closing the Incision; Dressing the Incision; Sponges and Pads Used in Abdominal Surgery. Anæsthesia.—Ether; chloroform; nitrous oxide and oxygen; nitrous oxide, oxygen and ether; anæsthesia by combined general and local methods; ethyl chloride. Local Anæsthesia; Solutions for Producing Local Anæsthesia. Technic of Producing Local Anæsthesia by the Injection of Novocaine.—Celiotomy incisions; vulvar or vaginal incisions; cervix operation or hysterotomy. Local Anæsthesia by Freezing with Ethyl Chloride; Spinal Anæsthesia in Pelvic Surgery; Multiple Operations; Operations During Pregnancy. Drainage.—Gall-bladder and gall-ducts; pancreas; kidney; bladder. Post-operative Care in Drainage Cases.

XXXVII. POST-OPERATIVE TREATMENT.....	663
Thirst; Pain Following Operation; The Diet; The Care of the Bowels; The Care of the Bladder; Enterocolysis; Posture After Operation; Fowler; Trendelenburg; Out of Bed; Dressing the Incision.	
XXXVIII. POST-OPERATIVE COMPLICATIONS.....	670
Shock.—Etiology; symptoms; treatment. Hemorrhage.—Varieties: capillary oozing; venous and arterial hemorrhage; hemorrhage after plastic operations; symptoms; diagnosis; treatment. Excessive Nausea and Vomiting. Tympanites. Peritonitis.—Etiology; symptoms; diagnosis; treatment. Intestinal Obstruction.—Etiology; symptoms; diagnosis; treatment. Acute Gastric Dilatation.—Etiology; symptoms; diagnosis; treatment. Bronchitis. Pleurisy. Nephritis. Suppression of Urine from Ureteral Obstruction. Phlebitis. Pulmonary Embolism.—Etiology; symptoms; diagnosis; treatment. Post-operative Renal Infection. Suppuration of the Incision. Local Inflammation or Suppuration in the Pelvis. Cystitis. Post-operative Cardiac Dilatation. Post-operative Parotitis. Acidosis.	
XXXIX. MECHANICAL AND MEDICINAL AIDS TO TREATMENT.....	696
Abdominal Support: Binders and Bandages.—Binder; corsets. Applications to the Endometrium; Applications to the Cervix; Applications to the Vagina; Applications to Bartholin's Glands; Applications to the Urethra and Skene's Tubules; The Use of Heat in Pelvic Inflammatory Disease; Electricity; Pessaries; The Electro-cautery and the Thermo-cautery; The Uterine Pack; The Vaginal Douche; The Vaginal Tampon.	
XL. RADIUM AND RÖNTGEN-RAY THERAPY	713
Radium; Carcinoma of the Cervix; Carcinoma of the Fundus; Myomata Uteri; Hemorrhagic Uteri; Carcinoma of the Vulva; Papillomata and Carcinomata of the Bladder; Rectal Diseases; Abdominal Tumors.	
XLI. VACCINE AND SERUM THERAPY IN GYNECOLOGY	725
Specific Therapy; Auto-serum Therapy; Vaccine Therapy; dosage.	

ILLUSTRATIONS

FIG.	PAGE
1. Schematic Outline Showing Development of Reproductive Organs.....	2
2. Enlarged Schematic Wolffian Tubule at Height of Development.....	3
3. Wolffian Bodies and Sexual Glands of a Human Embryo.....	3
4. Schematic Solid Reconstruction of the Reproductive Organs.....	4
5. Developing Ovary of Embryo.....	4
6. Development of the Cervix and the Vagina.....	5
7. Sketch Showing Formation of Bladder, Ureters, External Genitalia and Anus.....	5
8. External Genitalia of an Embryo 18 mm. Long.....	6
9. Indifferent Stage of External Genitals of Thirty-three-day Embryo.....	6
10. External Genitalia of Female Embryo of Nine Weeks.....	6
11. External Genitalia of Female Embryo of Eleven Weeks.....	6
12. External Genitalia of Female Embryo of Sixteen Weeks.....	6
13. Ovary of New-born Child.....	7
14. Ovary of New-born Child; Relationship of Ovarian Artery to Ovary, Tube and Uterus.....	7
15. Ovary of Child Two Years Old.....	8
16. Ovary of Girl Nine Years Old.....	9
17. Ovary of Girl Sixteen Years Old.....	10
18. Reconstructive Drawing Showing Ovary of Young Woman in Active Menstrual Life.....	10
19. Ovary of Woman Forty-two Years Old.....	11
20. Contents of Pelvis in Embryo of Three and One-half Months.....	12
21. Fallopian Tube and Ovary.....	13
22. Uterus Unicornis.....	15
23. Uterus Didelphys.....	15
24. Uterus Pseudodidelphys.....	16
25. Uterus Duplex Bicornis.....	16
26. Uterus Duplex Septus.....	16
27. Uterus Duplex Subseptus.....	16
28. Uterus Bicornis.....	17
29. Uterus Bicornis, with Dwarfing of One Horn.....	17
30. Double Vagina and Double Cervix.....	18
31. Atresia of Vagina; Manner of Closing Wound After Removing Obstructing Septum.....	19
32. Nearly Imperforate Hymen.....	20
33. Gynatresia; Bulging Imperforate Hymen, Simulating Large Cystocele.....	22
34. Gynatresia; Imperforate Hymen.....	23
35. Hæmatocolpos.....	24
36. Hæmatotrachelos; Hæmatocolpos.....	24
37. Hæmatometra; Hæmatotrachelos; Hæmatocolpos.....	24
38. Hæmatosalpinx; Hæmatometra; Hæmatotrachelos; Hæmatocolpos.....	24
39. Gynatresia of One-half of Double Uterus and Double Vagina.....	25
40. Gynatresia of One Uterus and Hæmatometra in Double Uterus.....	25
41. Division of Female Perineal Region Into Urogenital and Rectal Triangles.....	31
42. Normal Virginal Vulva Showing Component Parts.....	32
43. Histology of Various Parts of the Genital Tract.....	33
44. Vaginal Fornices; Posterior Fornix; Anterior Fornix.....	34
45. Sagittal Section Through Young Female Body.....	35
46. Vaginal Wall; Stratified Squamous Epithelial Surface and Connective Tissue.....	36
47. Anterior Aspect of Nulliparous Adult Uterus.....	36
48. Posterior Aspect of Nulliparous Adult Uterus.....	36
49. Lateral Aspect of Nulliparous Adult Uterus.....	37
50. Transverse Section of Uterus at Fundus.....	37
51. Transverse Section of Uterus Above Internal Os.....	38
52. Para-sagittal Section of the Pelvis.....	38
53. Histology of Cervix.....	39
54. Histology of Endometrium of Body of Uterus.....	40
55. Histology of Fallopian Tube.....	41
56. Histology of Ovary.....	42
57. Interior of Bladder and Relation of Ureter to Uterine Artery.....	44
58. View of Pelvis From Above.....	46
59. Lateral Sagittal Section of Female Pelvis.....	47

60. Supporting Ligaments of Uterus; Their Relation to Other Pelvic Structures.....	48
61. Frontal Section of Pelvis Through Urogenital Triangle.....	49
62. Semi-diagrammatic Picture Showing Course of Arteries, Veins and Lymphatics....	50
63. Fascia of Pelvic Floor.....	51
64. External Muscles, Fascia, and Structures of the Perineum.....	51
65. Muscles of Pelvic Floor from Below.....	52
66. Triangular Ligament in the Female.....	53
67. The Pelvic Diaphragm from Above.....	54
68. The Blood Supply of the Pelvic Viscera.....	55
69. Anatomy of Ureter; Course in Pelvis and Relation to Uterine Artery.....	56
70. Sagittal Section of Rectum: Hemorrhoidal Arteries, Veins and Lymphatics of Rectum and Anus.....	57
71. Blood-vessels of the Pelvis.....	58
72. Lymph Vessels and Glands of Pelvic and Lumbar Regions.....	59
73. 74, 75, 76. Mucous Membrane of Uterus in Various Phases of Menstruation.....	67
77. Uterine Mucous Membrane in First Day of Menstruation.....	68
78. Schematic Drawings, Showing Relation Between Ovulation and Menstruation....	69
79. Showing Collection of Blood Beneath Surface Epithelium, and Its Escape.....	70
80. Showing Two Layers of Decidua of Second Month, Decidua Compacta and Decidua Spongiosa.....	71
81. Showing Gland Duct of Decidua Compacta of the Second Month.....	72
82. Drawing Showing Relative Size of Imbedded Early Ovum and Uterus.....	73
83. Section Through Peters Ovum and Surrounding Uterine Mucous Membrane.....	74
84. Summit of the Peters Ovum.....	75
85. Chorionic Villus from the Second Month.....	76
86. Human Ovum, Showing Chorionic Villi.....	76
87. Anlage of Placenta from the Second Month.....	77
88. Pregnant Uterus at Term.....	78
89. Pregnant Uterus at End of First Stage of Labor.....	78
90. Height of Fundus of Pregnant Uterus at Different Periods.....	78
91. Softening of Lower Uterine Segment of Early Pregnancy.....	79
92. Gradual Obliteration of Internal Os and Cervical Canal at End of Pregnancy.....	79
93. Vaginal Wall Being Torn from Attachments and Pushed Forward.....	80
94. Bilateral Laceration and Elongation of Anterior Lip of Cervix.....	80
95. Distention of Perineal Muscles by Birth of Head.....	81
96. Distention of Perineum Just Before Birth of Head.....	82
97. Atrophic Changes in a Senile Uterus with Shrunken Appendages.....	83
98. Form of History.....	92
99. Showing Positions of Uterus with Full Bladder or Rectum or Both.....	112
100. Position of Uterus, with Distended Bladder and Rectum.....	113
101. Dorsal or Lithotomy Position.....	114
102. Knee-chest Position.....	115
103. Sims' Position, Left Latero-prone Position.....	115
104. Supine Position.....	116
105. Showing Regions of Abdomen.....	116
106. Sims' Speculum.....	117
107. Bivalve and Trivalve Speculum; Collapsible Tube of Lubricant; Ultzmann Syringe	118
108. Kelly's Urethral Speculum.....	119
109. Double Tenaculum.....	119
110. Long Thumb Forceps, Uterine Sound, Applicator, Spatula, Curved Dressing Forceps	120
111. Goodell's Dilator.....	120
112. Sims' Curette.....	121
113. Martin's Curette.....	121
114. Excision of Diseased Cervical Tissue for Microscopic Examination.....	122
115. Inspection of External Genitalia; Expression of Discharge from Urethra.....	123
116. Inspection of External Genitalia; Expression of Discharge from Bartholin's Glands	123
117. Gonococci Stained in Smear.....	124
118. Spirochæta Pallida.....	124
119. Exposure of Vagina and Cervix by Bivalve Speculum.....	125
120. Digital Examination and Schematic Outline of Antelexion.....	126
121. Digital Examination and Schematic Outline of Retroflexioversion.....	126
122. Digital Examination and Schematic Outline of Pelvic Mass.....	126
123. Schematic Outline Showing Prolapsed Ovary Palpable on Digital Examination....	126
124. Bimanual Examination; Schematic Outline of Anteversion and Pathologic Antelexion	127
125. Bimanual Examination; Schematic Outline of Retroflexioversion.....	127
126. Bimanual Examination; Schematic Outline of Pelvic Mass.....	128

127. Simple Digital Examination; Schematic Outline of Prolapsed Ovary.....	128
128. Position of Hands in Bimanual Examination of Pelvis.....	128
129. Outline Showing Position of Fingers in Examination of Tube and Ovary.....	129
130. Bimanual Examination with Uterus Drawn Down.....	129
131. Combined Recto-vaginal Examination.....	129
132. Trimanual Examination, Case of Ovarian Cyst.....	130
133. Lateral Aspect of Abdomen with Large Myomatous Uterus.....	131
134. Anterior Aspect of Abdomen with Uterus Deviated to Right.....	132
135. Anterior Aspect of Abdomen with Extreme Ascitic Distention.....	133
136. Lateral Aspect of Abdomen with Extreme Ascitic Distention.....	133
137. Lateral Aspect of Abdomen in Case of Large Ovarian Cyst.....	134
138. Lateral Aspect of Abdomen in Case of Pregnancy Near Term.....	134
139. Lateral Aspect of Abdomen in Case of Ovarian Cyst with Carcinomatosis.....	135
140. Cross Section of Abdomen; Reason for Coronal Resonance.....	136
141. Cross Section of Abdomen; Reason for Central Resonance and Lateral Dulness.....	136
142. Trimanual Method of Percussion of Kidney.....	139
143. Kelly's Improved Cystoscope.....	140
144. Nitze Catheterizing Cystoscope.....	141
145. Nitze Examining Cystoscope.....	141
146. Cylindrical Jar for Sterilization of Cystoscopes.....	142
147. Ureteral Catheter.....	143
148. Sterilizing Ureteral Catheters.....	144
149. Ureteral Calibrator.....	144
150. Irrigating Apparatus.....	145
151-152. Two-way Irrigator or Catheter; Top and Bottom Views.....	148
153. Catheterization of the Ureter.....	149
154. Röntgenogram of Ureteral Stone.....	151
155. Shadows Cast by Vermiform Concretion and by Phlebolith.....	152
156. Röntgenogram of Suspected Renal Calculus with Sound in Ureter.....	153
157. Röntgenogram Showing Stone in Upper Calyx of Right Kidney.....	154
158. History in This Case Indicated Ureteral Calculus.....	155
159. Röntgenogram Failed to Demonstrate a Calculus.....	157
160. Ptosis of the Left Kidney with Hydronephrosis.....	158
161. Examination of Rectum; Patient in Dorsal Position with Tuttle's Pneumatic Speculum.....	162
162. Examination of Anus, Buttocks Separated.....	163
163. Tuttle's Pneumatic Speculum.....	163
164. Kelly's Proctoscope.....	164
165. Examination of Rectum and Lower Sigmoid with Proctoscope.....	164
166. Kelly's Sigmoidoscope.....	165
167. Elephantiasis of Vulva.....	172
168. Chancre of Vaginal Introitus.....	173
169. Gumma of Vulva, with Secondary Infection and Ulceration.....	174
170. Condylomata Lata, Secondary Syphilis, Surrounding Vulva (in Color).....	174
171. Condylomata Lata of the Vulva and Anus.....	175
172. Syphilis (Secondary) of the Vulva and Anus.....	176
173. Syphilis (Secondary) of the Vulva and Anus.....	177
174. Syphilis (Secondary) of the Vulva and Anus.....	178
175. Gumma of the Vulva, Tertiary Syphilis.....	179
176. Chancroid.....	180
177. Venereal Warts.....	181
178. Varicose Veins of the Vulva.....	182
179. Hematoma of Vulva.....	183
180. Epithelioma of Vulva, Indurated Fungoid Ulcer.....	184
181. Lupus of Vulva, a Pre-ulcerative or Infiltrative Stage.....	185
182. Sarcoma of Left Labium Minus.....	186
183. Fibromyoma of Vulva (in Color).....	186
184. Lipoma of Right Labium Majus.....	187
185. Abscess of Left Vulvovaginal Gland.....	188
186. Extreme Cystic Distention of Vulvovaginal Gland.....	189
187. Cyst of the Posterior Vaginal Wall.....	194
188. Sarcoma of Vagina in Child Two and One-half Years Old.....	195
189. Case of Adenocarcinoma of Posterior Vaginal Wall.....	196
190. Large Rectocele in a Multipara.....	201
191. Sulcus Tears and Thinning of Perineal Body in a Multipara.....	202
192. Showing Support Given by Levator Ani and Triangular Ligaments to Pelvic Viscera.....	203

193. Showing Effect of Sulcus Lacerations of Levator Ani and Triangular Ligaments . . .	203
194. Complete Laceration of Perineum	204
195. Prolapse of Uterus; Prolapsed Rectal Mucosa; Fibrolipoma of Thigh	205
196. Cystocele; Rectocele	206
197. Normal Nulliparous Outlet, Patient Straining	207
198. Relaxed Outlet, Patient Straining	207
199. Relaxed Outlet	208
200. Emmet Perineorrhaphy; Outline of Denudation	209
201. Emmet Perineorrhaphy; Denudation Completed	210
202. Emmet Perineorrhaphy; Sulcus Sutures Tied on Both Sides	210
203. Transverse Fascial Split and Introduction of Crown Sutures	211
204. Diagrammatic Sketches of Emmet Perineorrhaphy	211
205. Hegar Perineorrhaphy; Lines of Denudation	212
206. Hegar Perineorrhaphy; Denudation Completed	212
207. Hegar Perineorrhaphy; Crown Sutures Introduced	213
208. Hegar Perineorrhaphy; Levator Ani Suture	214
209. Hegar Perineorrhaphy; Levator Suture in Marked Cases	215
210. Completion of Subcuticular Suture of Emmet or Hegar Perineorrhaphy	216
211. Operation for Complete Tear of Perineum	217
212. Operation for Complete Perineal Tear	217
213. Suture of Rectovaginal Septum by Linen	217
214. Diagram Showing Introduction of Sutures in Operation for Complete Tear of Perineum	218
215. Snger Anterior Colporrhaphy; Vaginal Wall and Underlying Fascia Being Cut Away	218
216. Snger Anterior Colporrhaphy; Suture Started at Anterior End of Incision on Vaginal Surface	218
217. Snger Anterior Colporrhaphy; Suture Carried Through Vaginal Wall	219
218. Anterior Colporrhaphy or Cystopexy; Outline of Initial Incision	219
219. Anterior Colporrhaphy or Cystopexy; Separation of Bladder from Anterior Vaginal Wall	219
220. Anterior Colporrhaphy or Cystopexy; Further Separation of Bladder from Uterine Wall	219
221. Anterior Colporrhaphy or Cystopexy; Introduction of Sutures	220
222. Interposition Operation for Prolapse	221
223. Interposition Operation	221
224. Schematic Sagittal Section, Showing Result of Interposition Operation	221
225. Large Cervical Polyp Projecting from External Os	224
226. Cervical Polyps, Showing Origin from Mucous Plicæ of Cervix	224
227. Elongation and Hypertrophy of Cervix	225
228. Nulliparous Cervix	227
229. Parous Cervix; Well Healed Bilateral Laceration; Mucus in Cervical Canal	227
230. Parous Cervix; Well Healed Bilateral Laceration	227
231. Deep Unilateral Laceration with Irregular Tag of Cervical Tissue	227
232. Stellate Laceration	227
233. Deep Bilateral Laceration; Unequal Division of Cervical Lips; Eversion	228
234. Deep Bilateral Laceration with Eversion of Lips	228
235. Nabothian Cysts of Cervix	228
236. Nulliparous Cervix; Extension of Cervical Mucosa	228
237. Nulliparous Cervix; No Extension; No Lacerations	229
238. Parous Cervix. Deep Bilateral Laceration	229
239. Deep Bilateral Laceration; Eversion of Cervical Lips	230
240. Test Showing Red, Angry-looking Surface is the Cervical Mucosa	231
241. Deep Bilateral Laceration; Eversion of the Mucosa	231
242. Trachelorrhaphy; Repair; Apex of Angle of Laceration Split	232
243. Trachelorrhaphy; Repair; Cervical Lips Denuded	233
244. Trachelorrhaphy; Repair; Two Upper Sutures are Tied	233
245. Trachelectomy; Cervical Lips Split Laterally	234
246. Trachelectomy; Cervical Lips Excised	234
247. Trachelectomy; Sutures Tied	235
248. Sagittal Section Showing Normal Antelexion and Anteversion of Uterus	237
249. Outline Showing Arc of Imaginary Circle Through Which Fundus Moves	237
250. Normal Position of Uterus	238
251. Retroflexion and Retroversion of Uterus	238
252. Pathologic Antelexion; Ill-developed Cervix and Narrow Canal	238
253. Retroversion; Slight Flexion; Descensus and Beginning of Prolapse	239
254. Showing Uterus in Normal Position, Ante-position and Retroposition	240

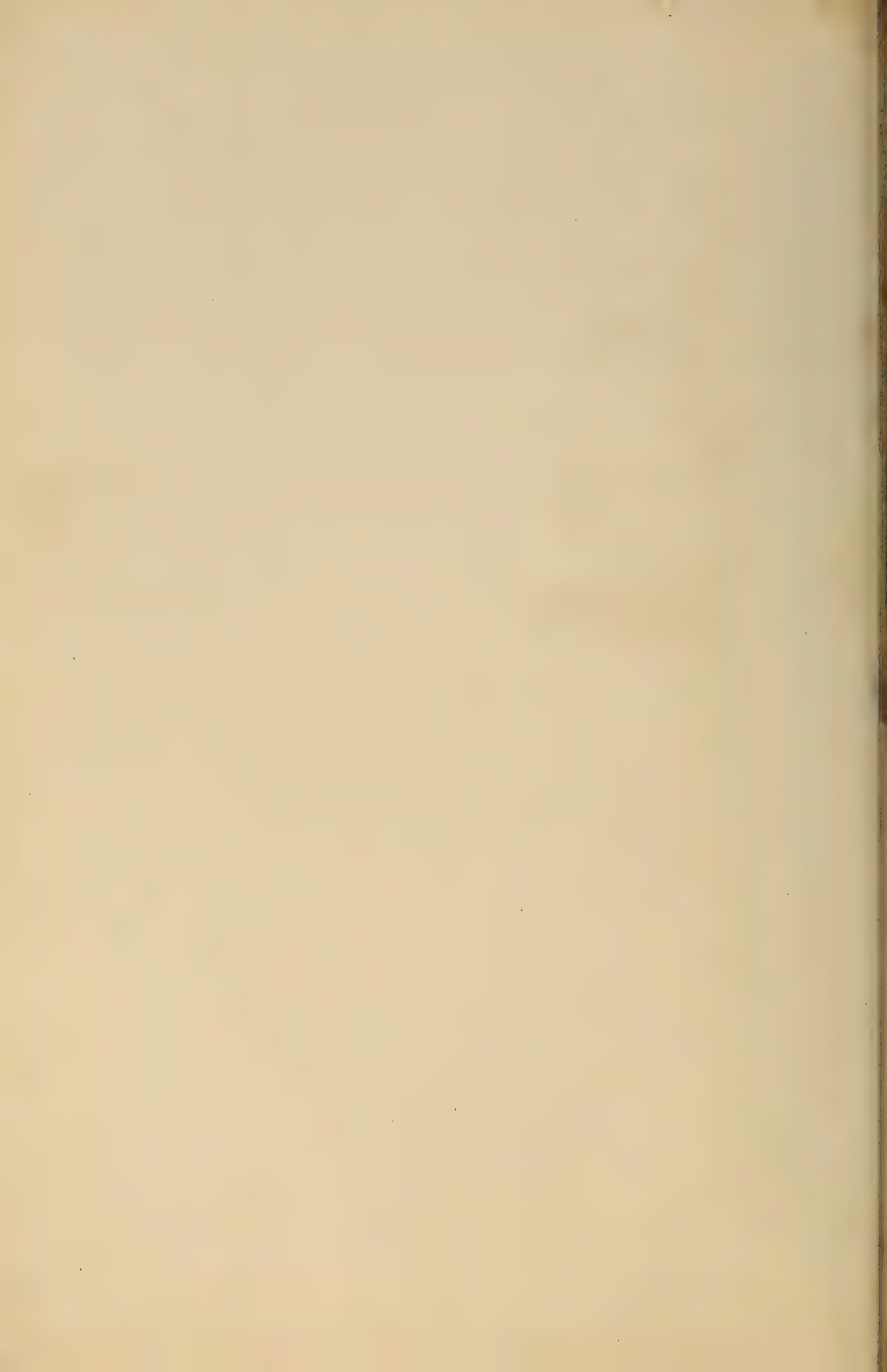
255. Showing Influence of Shortened Anterior Vaginal Wall.....	240
256. Divulsion of Cervix.....	241
257. Dudley Operation.....	242
258. Pozzi Operation.....	242
259-260. Norris Drain in Position.....	243
261. Sagittal Section Showing Uterus in Extreme Retroflexion.....	246
262. Replacement of Retroflexio-version of Uterus; Cervix Grasped with Tenaculum.....	248
263. Replacement of Retroflexio-version of Uterus; Uterus Straightened Out.....	248
264. Replacement of Retroflexio-version of Uterus; Index Finger in Rectum.....	249
265. Replacement of Retroflexio-version of Uterus; Cervix Pushed Back.....	249
266. Replacement of Retroflexio-version of Uterus; Tenaculum Has Been Removed.....	249
267. Replacement of Retroflexio-version of Uterus; Uterus in Slightly Exaggerated Ante- flexion and Anteversion.....	249
268. Patient in Knee-chest Position; Vaginal Fornix Packed with Tampons.....	250
269. Introducing a Pessary.....	251
270. Diagram Showing Mechanics of Pessary.....	252
271. Alexander's Operation.....	253
272. Ventrosuspension.....	254
273. Coffey's Operation, Steps 1 and 2.....	255
274. Coffey's Operation, Steps 3 and 4.....	255
275. Webster-Baldy Operation, Steps 1 and 2.....	256
276. Webster-Baldy Operation, Step 3.....	256
277. Simpson Operation; Skin and Fat Retracted.....	257
278. Simpson Operation; Ligament Pulled Up.....	258
279. Simpson Operation; Needle Passed Through Fascial Cut.....	259
280. Simpson Operation; Round Ligaments Sutured to Under Surface of Fascia.....	259
281. Pressure upon Uterus from All Sides Equal.....	264
282. Pelvic Floor Torn, Uterus is Now Part of Floor of Pelvis.....	264
283. Outline Showing Steps in Development of Prolapsed Uteri.....	265
284. Prolapse of Uterus; Cervix Presenting at Vaginal Orifice.....	266
285. Complete Prolapse of Uterus with Bladder Diverticulum.....	267
286. Principle of Support of a Menge Pessary.....	269
287. Extraperitoneal Fixation of Fundus, Step 1.....	270
288. Extraperitoneal Fixation of Fundus, Step 2.....	270
289. Shortening of Uterosacral Ligaments.....	271
290. Diagnostic Curettage.....	280
291. Chronic Arteriosclerosis or Fibrosis Uteri.....	281
292. Diagram Illustrating Vascular Channels of Uterine Wall and Endometrium.....	282
293. Section of Wall of Nulliparous Uterus.....	283
294. Section of Wall of Multiparous Uterus.....	283
295. Group of Arteries from Vascular Layer of Multiparous Uterus.....	284
296. Small Artery of Vascular Layer of Multiparous Uterus.....	285
297. Large Vein from Vascular Layer of Multiparous Uterus.....	286
298. Hydatidiform Mole.....	290
299. Multiple Subserous Myomata.....	293
300. Longitudinal Sagittal Section of Uterus.....	294
301. Uterus Opened, Showing Pedunculated Submucous Myoma.....	295
302. Intraligamentous Fibroid.....	296
303. Myomatous Uterus Complicated by Inflammatory Lesions of Adnexa.....	297
304. Interstitial Myoma Undergoing Necrosis and Cyst Formation.....	298
305. Necrosis of Submucous Myoma.....	298
306. Necrotic Submucous Myoma Projecting from Cervix.....	299
307. Cervical Myoma.....	300
308. Multiple Myomata of Posterior Uterine Wall.....	301
309. Incarcerated Subserous Myoma.....	302
310. Myoma Uteri and Pregnancy.....	308
311. Abdominal Myomectomy; Incision Through Capsule of Myoma.....	314
312. Abdominal Myomectomy; After Making Incision.....	315
313. Abdominal Myomectomy; After Exposing the Myoma.....	315
314. Abdominal Myomectomy; Bed of Myoma Filled up With Catgut Sutures.....	315
315. Abdominal Myomectomy; Uterine Incision Closed with Suture of Catgut.....	315
316. Supravaginal Hysteromyomectomy with Bilateral Salpingo-oophorectomy.....	316
317. Supravaginal Hysteromyomectomy with Bilateral Salpingo-oophorectomy.....	317
318. Supravaginal Hysteromyomectomy with Bilateral Salpingo-oophorectomy.....	318
319. Supravaginal Hysteromyomectomy with Bilateral Salpingo-oophorectomy.....	319
320. Hysteromyomectomy from Side to Side.....	320

321.	Supravaginal Hysteromyomectomy with Bilateral Salpingo-Oöphorectomy.....	321
322.	Supravaginal Hysteromyomectomy with Bilateral Salpingo-Oöphorectomy.....	322
323.	Supravaginal Hysteromyomectomy with Bilateral Salpingo-Oöphorectomy.....	323
324.	Supravaginal Hysteromyomectomy with Conservation of Adnexa.....	324
325.	Supravaginal Hysteromyomectomy with Conservation of Adnexa.....	325
326.	Supravaginal Hysteromyomectomy with Conservation of Adnexa.....	325
327.	Diffuse Adenomyoma of Uterus.....	326
328.	Longitudinal Transverse Section of Uterus.....	326
329.	Epithelioma of Cervix.....	331
330.	Early Epithelioma of Cervix.....	332
331.	Squamous Cell Carcinoma of Vaginal Cervix.....	332
332.	Showing Predisposition of Epithelioma to Spread by Continuity of Surface.....	333
333.	Showing Spread of Epithelioma of Cervix, Sagittal and Transverse Sections.....	334
334.	Showing Spread of Adeno-carcinoma of the Cervix.....	335
335.	Advanced Epithelioma of the Cervix.....	336
336.	Histological Section of Finger-like Projection from Cervix.....	337
337.	Early Carcinoma of the Endometrium.....	343
338.	Advanced Carcinoma of the Endometrium.....	344
339.	Chorioepithelioma of the Fundus (in Color).....	(Frontispiece)
340.	Metastases of Chorioepithelioma in Kidney, Liver, Lung and Pancreas.....	347
341.	Panhysterectomy for Carcinoma.....	349
342.	Passing Loop of Catgut about Ureter.....	350
343.	Ligation of Uterine Vessels.....	351
344.	Dissection of Bladder and Ureters.....	352
345.	Application of Clamps to Vaginal Wall.....	353
346.	Paravaginal Incisions.....	354
347.	Vaginal Hysterectomy.....	355
348.	Acute Gonorrhoeal Salpingitis, Gross.....	359
349.	Acute Gonorrhoeal Salpingitis.....	360
350.	Uterus and Appendages in Extensive Pelvic Inflammatory Disease Exposed in Incision.....	361
351.	Uterus and Appendages in Extensive Pelvic Inflammatory Disease; Adhesions Divided.....	362
352.	Pyosalpinx and Ovarian Abscess.....	363
353.	Tubo-ovarian Abscess.....	364
354.	Hydrosalpinx.....	365
355.	Tubo-ovarian Cyst.....	366
356.	Tuberculous Pyosalpinx, Torsion and Necrosis.....	369
357.	Interstitial Pregnancy.....	370
358.	Early Extrauterine Pregnancy, Rupture and Bleeding.....	371
359.	Extrauterine Pregnancy with Beginning Tubal Abortion.....	372
360.	Longitudinal Section of Tube Shown in Fig. 359.....	373
361.	Longitudinal Section of Pregnant Tube.....	374
362.	Abscess of the Ovary.....	382
363.	Sagittal Section Showing Displacement of Small Uterus.....	385
364.	Multilocular Cystadenoma of Ovary.....	386
365.	Diagram Showing Difference in Effect Upon Cervix.....	387
366.	Early Parovarian Cyst.....	390
367.	Parovarian Cyst.....	391
368.	Diagram Showing Intra- and Extraperitoneal Position of Cysts (in Color).....	392
369.	Fibroma of Ovary.....	392
370.	Papillomatous Cystadenoma of Ovary.....	394
371.	Dermoid Cyst of Ovary.....	397
372.	Ovarian Teratoma with Histologic Sketches of Tissue.....	398
373.	Displacement of Uterus and Stretching of Tube in Pelvic Intraligamentous Tumor.....	400
374.	Corpus Luteum Cyst of Ovary.....	403
375.	Ovarian Cyst Twisted on Its Pedicle.....	405
376.	Ovarian Cyst with Torsion of Its Pedicle.....	406
377.	Diagram Illustrating Spread of Gonorrhoeal Infection.....	413
378.	Bilateral Pyosalpinx.....	417
379.	Resection of the Ovary.....	418
380.	Salpingostomy.....	419
381.	Diagram Showing Streptococcus and Staphylococcus Infections.....	420
382.	Vaginal Incision and Drainage; Posterior Lip of Cervix Held Forward.....	426
383.	Vaginal Incision and Drainage; Abscess Located by Bimanual Palpation.....	427
384.	Salpingo-oöphorectomy; Points of Ligation and Line of Excision.....	435

385. Salpingo-oöphorectomy; Suture of Cornua and Beginning Peritonealization.....	435
386. Salpingo-oöphorectomy; Suture of Cornua and Completion of Peritonealization....	435
387. Salpingo-oöphorectomy; Posterior Fixation of Round Ligament.....	436
388. Salpingo-oöphorectomy; Points of Ligation and Lines of Excision.....	436
389. Salpingectomy; Suture of Cornua.....	437
390. Salpingectomy; Peritonealization.....	437
391. Salpingectomy; Peritonealization, First Step.....	438
392. Salpingectomy; Peritonealization, Second Step.....	438
393. Disinfection of Skene's Tubules.....	441
394. Urethral Tampon in Position.....	444
395. Saturating Urethral Tampon.....	444
396. Self-Retaining or Mushroom Catheter.....	446
397. Prolapsed Urethral Mucosa; Outline of Denudation.....	447
398. Prolapsed Urethral Mucosa; Denudation Completed.....	447
399. Prolapsed Urethral Mucosa; Sutures Introduced.....	447
400. Operation for Relaxation of Vesical Neck of Urethra, First Step.....	448
401. Operation for Relaxation of Vesical Neck of Urethra, Second Step.....	448
402. Urethral Caruncle.....	450
403. Irrigation of Bladder With Two-way Catheter.....	455
404. Vesicovaginal Fistula.....	463
405. Urethrovaginal Fistula.....	463
406. Vesicocervical Fistula.....	464
407. Rectovaginal Fistula.....	464
408-409. Ureterovaginal Fistula.....	464
410. General Scheme of Operation in Vesicovaginal Fistula.....	467
411. Tuberculosis of Kidney; Upper Half Diseased.....	474
412. Suspension of Kidney by Edebohl's Technic.....	482
413. Bloodless Nephrotomy Incision.....	483
414. Resection of Last Rib in Nephrectomy.....	484
415. Ureteral Anastomosis.....	492
416. Uretero-vesical Anastomosis.....	493
417. Method of Implanting Ureter into Intestine.....	494
418. Method of Implanting Ureter into Intestine.....	495
419. Appendicectomy.....	504
420. Appendicectomy (Clark's Method).....	506
421. Triangular Shape of Abdominal Cavity on Sagittal Section.....	507
422. General Ptosis.....	508
423. Midline Ptosis.....	509
424. Right-sided Ptosis.....	510
425. Exercises for Ptotic Patients; Simple Means of Obtaining Trendelenburg Position..	511
426. Exercises for Ptotic Patients; Exaggerated Expansion of Chest.....	511
427. Exercises for Ptotic Patients; Leg Flexed Upon Thigh.....	512
428. Beyea's Operation; Suturing of Gastrohepatic Omentum.....	514
429. Gastropexy; Coffey's Operation.....	515
430. Diagram Illustrating Beyea's Operation.....	515
431. Scheme of Completed Beyea's and "Hammock" Operation.....	516
432. Suspension of Hepatic Flexure; Reed's Method.....	517
433. Suspension of Sigmoid.....	518
434. Points of Anastomosis and Obstruction in Gastro-intestinal Tract.....	519
435. Excision of Fistula in Ano.....	526
436. Removal of Hemorrhoids by Clamp and Cautery.....	529
437. Moschowitz's Conception of Prolapse of Rectum; Incipient Prolapse (in Color)...	530
438. Moschowitz's Conception of Prolapse of Rectum; Partial Prolapse (in Color)...	530
439. Moschowitz's Conception of Prolapse of Rectum; Incomplete Prolapse (in Color)...	531
440. Moschowitz's Conception of Prolapse of Rectum; Complete Prolapse (in Color)...	531
441. Scheme for Inserting Sutures in Moschowitz's Operation.....	533
442. Normal Posture.....	537
443. Kangaroo Posture.....	539
444. Gorilla Posture.....	539
445. Slumped Visceroptotic Figure.....	540
446. Overfeminine Figure.....	540
447. Patient's Outline Being Traced.....	541
448. Corset for Kangaroo Posture.....	544
449. Corset for Gorilla Posture.....	544
450. Bad Type of Corset. Hour-glass Shape.....	545
451. Good Type of Corset.....	545

452. Storm's Sacroiliac Belt.....	548
453. Merrill's Sacroiliac Splint.....	549
454. Fat Overhanging Abdomen.....	551
455. Smear of Pus from Urethra, Vagina, and Cervix.....	557
456. Appearance of Gonococci in Stained Preparation (in Color).....	558
457. Tuberculous Pyosalpinx with Torsion of Ovary and Tube.....	565
458. Chancre of Cervix, Engrafted on an Erosion.....	572
459. Chancre of Cervix.....	573
460. Secondary Ulcer of Posterior Lip of Cervix.....	573
461. Schematic Outline of Generative Tract Showing Escape of Ovum, Penetration of Spermatic Particles, Fertilization of Egg.....	598
462. Semi-diagrammatic Outline of Uterus Showing Various Causes of Sterility.....	599
463. Semi-diagrammatic Outline of Uterus Showing Various Causes of Sterility.....	600
464. (A) Atrophic Ovary; (B) Thickened Capsule; (C) Abdominal Ostium of Tube.....	601
465. Sterility Produced Through Gonorrhœa Causing Pyosalpinx, Perioöphoritis and Pelvic Adhesions.....	602
466. Abdominal Incisions.....	624
467. Battle's Incision: (A) Skin Incision; (B) Fascial Incision.....	625
468. Battle's Incision: (A) Through Semilunar Line; (B) Through Anterior Lamella of Rectus; (c) Omentum; (d) Rectus Muscle.....	626
469. McBurney's Incision; Skin Incision.....	627
470. McBurney's Incision; External Oblique Split.....	628
471. McBurney's Incision; Internal Oblique Split.....	628
472. McBurney's Incision: (A) External Oblique; (B) Internal Oblique; (C) Peritoneum; (D) Appendix.....	629
473. Prone Position for Kidney Operations.....	629
474. Kelly's Incision.....	630
475. Mayo's Incision.....	630
476. Muscles of Lumbar Area, Showing Outline of Edebohl's Incision and Mayo's Incision.....	631
477. Israel's Incision.....	632
478. Robson's Incision.....	632
479. Towelling the Incision, One Side Completed.....	633
480. Towelling the Incision, Both Sides Completed.....	634
481. Incision Made, Sides Protected with Gauze Pads, Self-retaining Retractor in Position.....	634
482. Separation of Muscle Fibers.....	635
483. Opening the Peritoneum.....	635
484. Separation of Rectus Muscle from Its Lateral Attachments.....	636
485. Lengthening the Incision.....	636
486. Eversion of Peritoneum with Closing Suture; First Method.....	637
487. Trendelenburg (Elevated Pelvis) Position.....	638
488. Elliott Position (Elevated Thorax) for Upper Abdominal Operations.....	638
489. Eversion of Peritoneum; Closing Suture; Second Method.....	644
490. Closing Fascia, Showing Detail of Suture for Overlapping.....	645
491. Finish of Buttonhole Stitch.....	646
492. Suprapubic Pelvic Drain.....	647
493. Abdominal Dressing Applied.....	648
494. Enteroclysis Apparatus with Visible Drip.....	666
495. Visible Drip Glass Connecting Tube.....	666
496. Bed with Head Elevated.....	667
497. Fowler Bed.....	668
498. Portable Heat Cabinet.....	673
499. Short-circuiting for Intestinal Obstruction, Ileo-sigmoidostomy.....	683
500. Short-circuiting for Intestinal Obstruction, Ileo-colostomy.....	683
501. Abdominal Binder for Post-operative Use.....	697
502. Bivalve and Sims' Specula Introduced—Patient in Dorsal and Sims' Position—Exposure of Cervix and Vaginal Vault.....	699
503. Smith Pessary—Used in Treatment of Retroversion.....	701
504. Hodge Pessary—Used When Vaginal Vault is Shallow.....	701
505. Soft-rubber Ring Pessary; Useful in Elderly Women with Narrow Vaginal Orifice.....	702
506. Disk Pessary; Useful in Elderly Women with Descensus and Marked Cystocele.....	702
507. Menge Pessary (Assembled); Useful in Prolapsus in Elderly Women.....	703
508. Menge Pessary (with Stern Detached).....	703
509. Intrauterine Douche Nozzle.....	704
510. Vaginal Vault Packed with Tampons.....	704
511. Uterine Pack.....	705
512. Vaginal Pack with Suprapubic Pressure.....	705

513. Vaginal Douche Nozzle of Glass.....	706
514. Sketch of Correct Position for Douche.....	706
515. Vaginal Tampon.....	707
516. Filling Vaginal Tampon.....	708
517. Good Type of Corset.....	709
518. Exercises for the Nervous Woman—First Exercise.....	710
519. Exercises for the Nervous Woman—Second Exercise.....	710
520. Exercises for the Nervous Woman—Third Exercise.....	710
521. Exercises for the Nervous Woman—Fourth Exercise.....	710
522. Exercises for the Nervous Woman—Fifth Exercise.....	710
523. Exercises for the Nervous Woman—Sixth Exercise.....	710
524. Exercises for the Nervous Woman—Seventh Exercise.....	710
525. Exercises for the Nervous Woman—Eighth Exercise.....	710
526. Means of applying Radium in Gynecological Diseases—Needles Containing Radium; Radium Enclosed in Platinum Capsules.....	716



INTRODUCTION

MEDICAL text-books vary greatly in literary style and construction; thus, one embodies the complete individuality of the author, as exemplified by his daily clinical work, but scant reference being made to the literature contributing to his subject; another offers a digest of a vast bibliography, more or less well selected, depending on the competency of the author to act as a judge, and endeavors to feature the cardinal points that he considers worthy of imitation. Such text-books, however, evidence, on the one hand, a lack of judicial balance, and, on the other, an absence of a well-defined hall-mark stamped by the writer's own experience. Still a third author, as represented by Doctor Anspach, selects his literary references with great care and, combining these with the observations gathered from his matured experience, he constructs a well-balanced text-book.

In Doctor Anspach's treatise on Gynecology ample reference is made to epoch-making and constructive contributions, but his text is so well arranged as to make it devoid of encyclopædic dulness. Painstaking care has been devoted to the elucidation of all the basic factors in embryology, anatomy, and physiology, variations from which mark abnormal morphology, and morbid physical changes that lead to the many functional disturbances observed in gynecologic practice.

It is a common observation among teachers in our medical schools that students well drilled in the cardinal branches of the first two years, all too frequently approach the clinical problems of the last two years so deficient in this fundamental knowledge as to make its translation into practical medicine of little or no value. To bridge this hiatus between the scientific and the clinical domain Doctor Anspach has drawn from the newest, as well as from the classic, sources of information, the specialized and general facts that will freshen up and adapt the student's mind for the fullest comprehension of gynecologic problems.

From the chapters on Embryology, Developmental Anomalies, Anatomy, and Physiology the reader is carried logically forward into the intricacies of anamnesis, physical examination, and laboratory investigations, these chapters being so closely correlated as to develop the deductive powers of the student, making of him a well-poised diagnostician, rather than the slave of a memorized symptomatology that, when the atypical case is encountered, inevitably leads him into a quagmire of doubt.

When the chapters on the practice of gynecology are reached, all the capital procedures that have found a stable setting in practice are considered, and usually more than one method is offered for the reader's selection.

A most instructive chapter is that devoted to the hygiene and proper care of adolescent girls, a subject that, because of its ultimate influence upon the welfare of the adult woman, is of far-reaching importance. All too frequently of late gynecologic text-books are so crammed with surgical thera-

peutics as largely to exclude prophylactic measures and immediate medical and hygienic treatment of conditions that, if not cured in the early stages, will certainly attain surgical proportions.

In this book the general practitioner will find a wealth of suggestions as to office and bedside treatment of gynecologic patients. Special consideration is given to the endocrine system in its relation to the functional aberrations of women. Our knowledge of this abstruse subject is at best more or less inchoate, but that which is required by the gynecologist has been clearly set forth.

In such special complaints as local skin affections and backache, Doctor Anspach has called to his aid the services of skilled specialists, who give to these subjects a breadth of view that is not to be found in the usual textbooks on gynecology. Here, for the first time, the therapeutic value of radium and the Röntgen ray has received adequate consideration. Full working instructions as to the choice of cases and the application of these remedies in the treatment of carcinoma and myoma of the uterus and myopathic hemorrhages are given. That able röntgenologist, Dr. Henry Pancoast, has brought this portion of Doctor Anspach's book well abreast of the times.

To attempt to draw attention to all the excellent features of this textbook would encompass more space than has been allotted to the introductory matter. Suffice it to say that the work is most comprehensive, and deals in a highly instructive way not only with diseases of women, but also with those coincident renal and abdominal lesions that are frequently encountered in the course of gynecologic affections.

In concluding this introductory note I take pleasure in extending a cordial commendation to a book that has had the well-balanced authorship of a specialist who has devoted a number of years to faithful work as an investigator and as a teacher, and to the practice of gynecology and abdominal surgery in their broadest and best sense.

JOHN G. CLARK.

Philadelphia,
Jan. 21, 1921.

GYNECOLOGY

CHAPTER I EMBRYOLOGY

EMBRYOLOGIC STRUCTURES

The Wolffian Body and the Wolffian Duct.—The Wolffian body and the Wolffian duct are the first structures to appear in the development of the genito-urinary system in man. Each Wolffian body is made up of a series of tubules terminating at one extremity in a convoluted vascular tuft forming a glomerulus, and at the other emptying into the Wolffian duct (Fig. 1, *a*). Each tubule comprises a glomerulus and a secreting and a collecting area (Fig. 2). The Wolffian body is a functioning excretory organ—the primitive kidney—that attains full development at about the end of the second month (Fig. 3). Its excretion is discharged into the Wolffian duct, which runs toward the tail of the embryo and empties into the cloaca or dilated terminal segment of the large gut. Almost as soon as it is fully formed the Wolffian body begins to atrophy, its function being gradually assumed by the true kidney, which has developed in the meantime.

The Müllerian Duct.—The Müllerian duct develops at the side of, and is closely related to, the Wolffian duct (Fig. 1, *b*). The lower parts of both ducts on each side converge toward those of the opposite side. From the point at which they meet the ducts run toward the cloaca, forming the urogenital strand, the Müllerian ducts running in the median line and the Wolffian ducts to the outer side (Fig. 4).

The Sexual Gland.—At about the time the Müllerian duct is formed, the cells on the median surface of the Wolffian body become aggregated, forming what is known as the sexual gland (Fig. 1, *c*). In the female this aggregation ultimately develops into the ovary, some of the original cells, distinguished by their large size, clear protoplasm, and conspicuous nucleus, constituting the primary germ cells or the primordial ova (Fig. 5), the remaining cells forming the germinal epithelium.

FŒTAL STRUCTURES

The Ovary.—The cells of the sexual gland receive vascular connective tissue from the Wolffian body, separating them into large islands or strands in which the primitive ova are surrounded by the germinal epithelium. The larger islands are divided into smaller ones, until ultimately groups are formed that consist of one primordial ovum surrounded by a ring of germinal epithelium, constituting the primordial follicles of the ovary. These follicles are embedded in a vascular connective-tissue stroma that, at the periphery of the organ, is condensed and forms a capsule that, from its white appearance, is known as the *tunica albuginea* (Fig. 5).

The Uterus.—The apposed surfaces of the Müllerian ducts—one from each side—become fused at about the eighth week. The septum disappears, and the two tubes become converted into a single larger tube that forms the uterus (Fig. 1, *d*).

The Fallopian Tubes.—Above the point where they fuse to form the uterus, the Müllerian ducts remain separated and become the Fallopian tubes.

The Vagina.—The vagina is derived from the lower extremities of the fused Müllerian ducts. For a time this portion of the duct is solid, but at about the fourth month it becomes hollowed out and communicates with the cloaca (Fig. 1, *e* and Fig. 6).

The External Genitalia.—The enlarged terminal segment of the hind-gut known as the cloaca is closed externally by a membrane, becoming divided into two sections by the projection of the perineal ridge (Fig. 7). The anterior section is known as the *urogenital sinus*. At about the fifth week a rounded projection, the *genital tubercle*, is formed in front. Upon its under surface it is divided by a groove; after rupture of the cloacal membrane the edges of this groove form the labia majora, labia minora, and the clitoris. The opening into the urogenital sinus between the labia becomes the vulvar cleft, and the sinus itself is now the vestibule. The vagina communicates with the urogenital sinus by an aperture that later becomes the vaginal orifice. It is guarded by annular folds which subsequently become the hymen. The posterior part of the cloacal space is the gut section, and between it and the urogenital section a wedge of tissue becomes the perineal body (Figs. 8–12).

The Bladder and Urethra.—The anterior part of the urogenital section of the cloaca is designated as the allantoic space; the primitive ureters empty into it posteriorly.

The upper part of the allantoic space becomes expanded and forms the body and summit of the bladder, while the lower part, into which the ureters open, forms the vesical trigone and urethra (Fig. 7).

The Rectum.—The posterior section of the cloaca forms the rudimentary

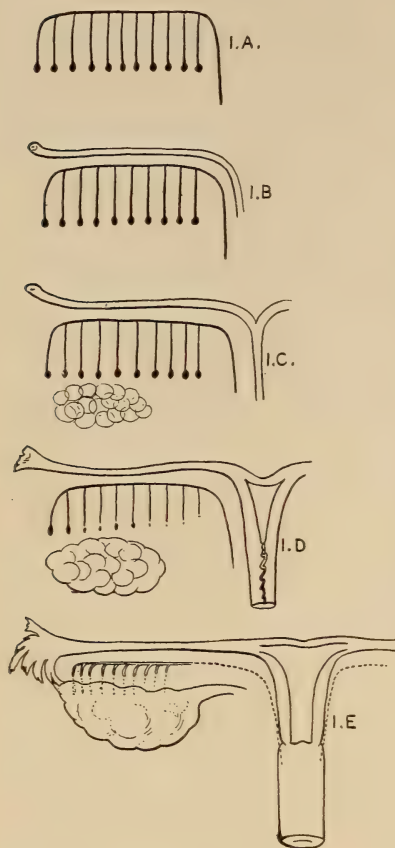


FIG. 1.—Schematic outline showing the development of the reproductive organs: (A) showing the Wolffian tubules, with glomeruli at the distal ends, entering the Wolffian duct; (B) the Müllerian duct developing parallel with, and to the mesial aspect of the Wolffian duct; (C) fusion of the Müllerian ducts of both sides to form the primitive uterovaginal canal and the Fallopian tubes; development of the genital gland below the Wolffian tubules; (D) atrophy of the Wolffian tubules and disappearance of the glomeruli, further development of the genital gland, beginning formation of fimbria at the abdominal ostium of tube, development of the uterine cavity and the differentiation of it from the vaginal canal; (E) atrophic remains of the Wolffian structures, the genital gland has become the ovary, the free end of the Müllerian duct is represented by the fully developed Fallopian tube; the fused portion is represented by the uterus and the vagina.

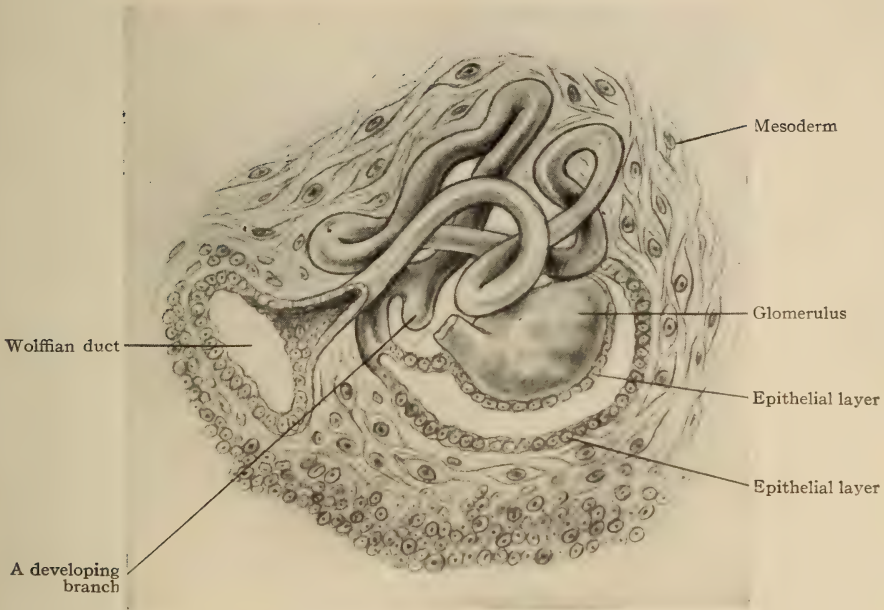


FIG. 2.—Enlarged schematic Wolfian tubule at the height of its development, from an embryo 10 mm. long. (Kollmann.)

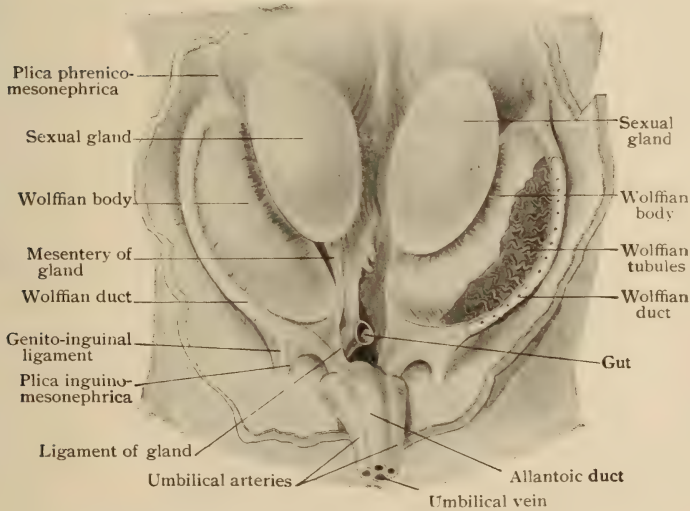


FIG. 3.—The Wolffian bodies and the sexual glands of a human embryo of about six weeks. (Piersol.)

rectum. Towards this an invagination of the ectoderm is projected from the surface. The two finally meet, and fuse by the absorption of the intervening tissues; the point of fusion marks the line of division between the anus and the rectum (Fig. 7).

The Ureter and Kidney.—The ureter has its origin in a bud-like expan-

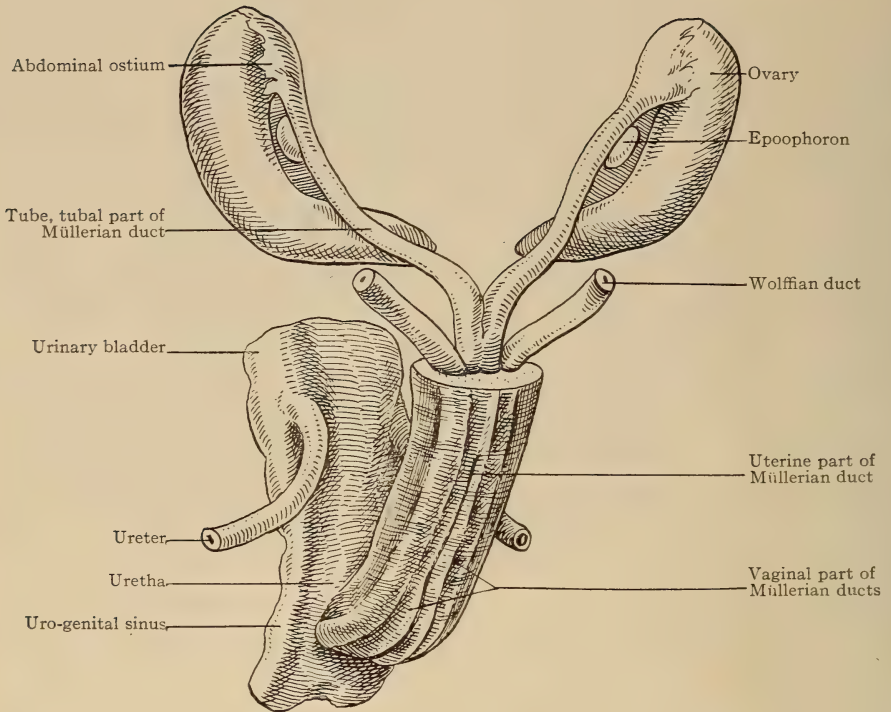


FIG. 4.—Showing a schematic solid reconstruction of the reproductive organs, especially the urogenital strand, from fetus 29 mm. long. (Kollmann.)

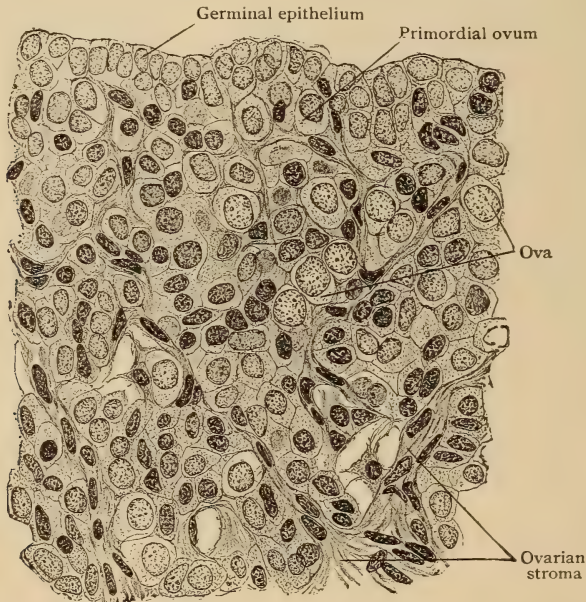


FIG. 5.—Developing ovary of embryo; germ cells being broken up by stroma and vascular tissue. (Piersol.)

sion from the lower end of the Wolffian duct, near the cloaca. It grows upward, behind the Wolffian body, and here its upper extremity dilates and

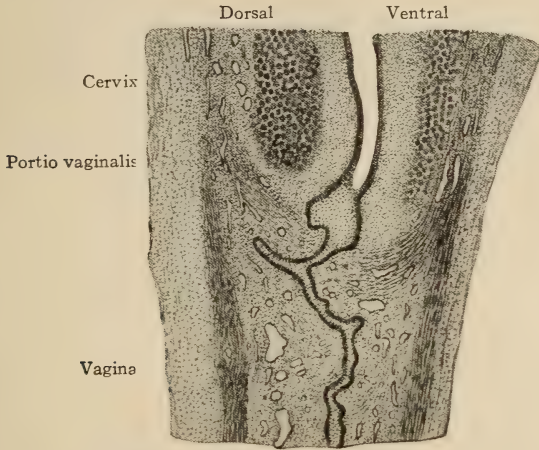


FIG. 6.—Development of the cervix and the vagina. Median longitudinal section of the utero-vaginal canal at the level of the portio vaginalis uteri of an embryo 260 mm. long. The portio vaginalis is beginning to be defined and the supravaginal circular muscle is developing. The lumen extends to its lower end, which is closed by an epithelial plug. The vagina is still altogether solid, its future lumen is indicated by the solid epithelial cord that traverses it. From this cord there grows into the surrounding mesenchyme, forward and backward at different levels, two solid projections of epithelium, the anlagen of the anterior and posterior fornices. (Keibel and Mall.)

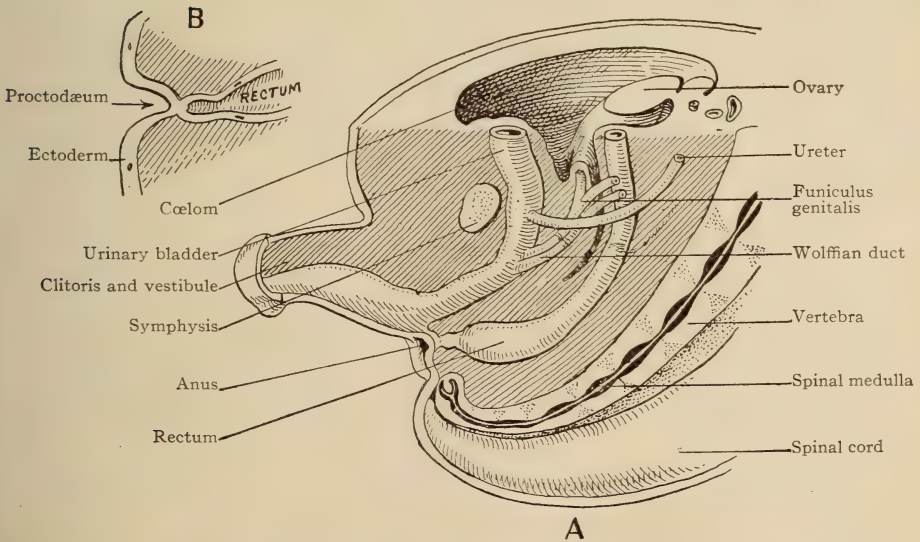


FIG. 7.—A and B: (A) sketch of a model exhibiting the formation of the bladder, ureters, external genitalia and anus, from a fetus 29 mm. long x 60; (B) detail of "A" showing formation. (Kollmann.)

subdivides, forming the renal pelvis and calyces, and finally also the collecting tubules. The remainder of the kidney is developed from a surrounding

area of tissue termed the *renal blastema*, the tubules of which subsequently unite with those growing from the renal pelvis.

THE GENERATIVE ORGANS AT BIRTH AND DURING CHILDHOOD

At birth the female generative organs have not attained their full development. This process goes on slowly during childhood, and is most marked in the years just preceding the establishment of the menstrual function.

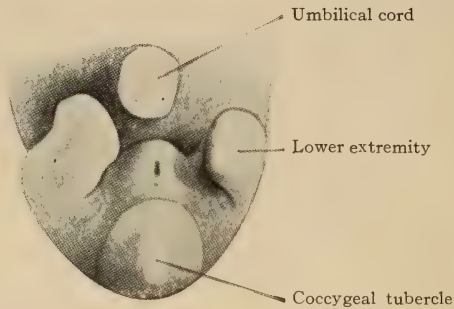


FIG. 8.—External genitalia of an embryo 18 mm. long. Between the umbilicus and the coccygeal tubercle is the cloacal tubercle; on its anal slope are the ostium urogenitale and the anal groove. (Keibel and Mall.)

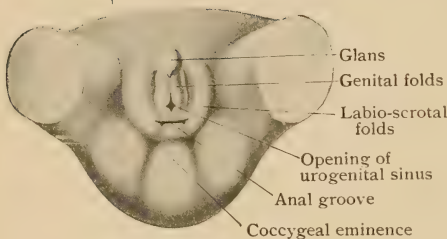


FIG. 9.—Indifferent stage of external genitals of embryo of thirty-three days. X8. (Keibel.)

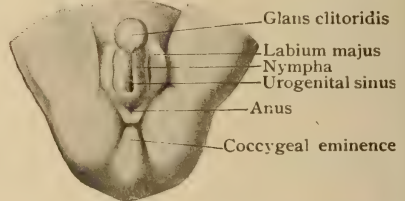


FIG. 10.—External genitalia of the female, embryo of nine weeks. (Keibel.)

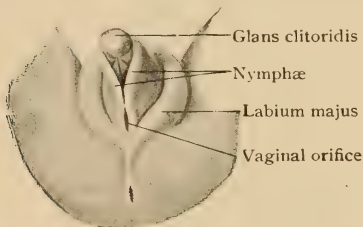


FIG. 11.—External genitalia of the female, embryo of eleven weeks. (Kollmann.)

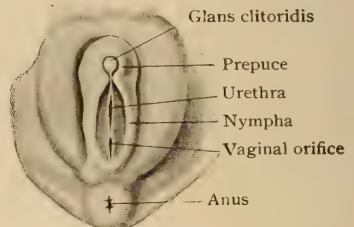


FIG. 12.—External genitalia of the female, embryo of sixteen weeks. (Kollmann.)

The Ovary.—At birth the ovary is long and narrow, somewhat resembling, on triangular cross-section, a dog's ear. In the earliest days it lies above the true pelvis, but during the first two years of life it drops below the pelvic brim. It grows slowly and attains its full development at

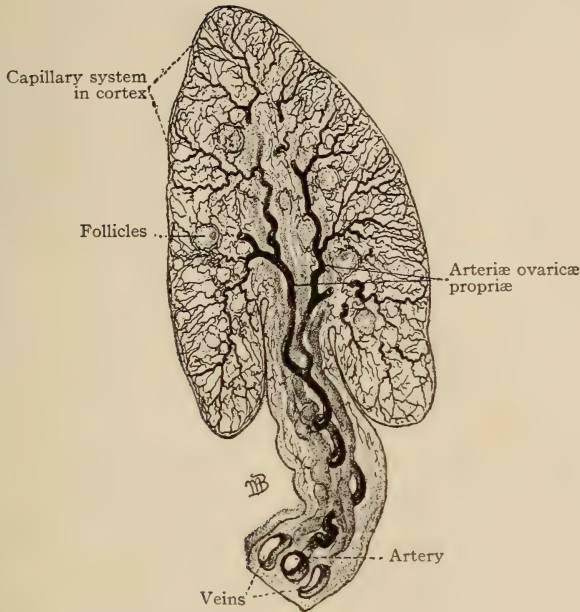


FIG. 13.—Ovary of new-born child. Vessels injected with lamp-black in gelatine. (Clark.)

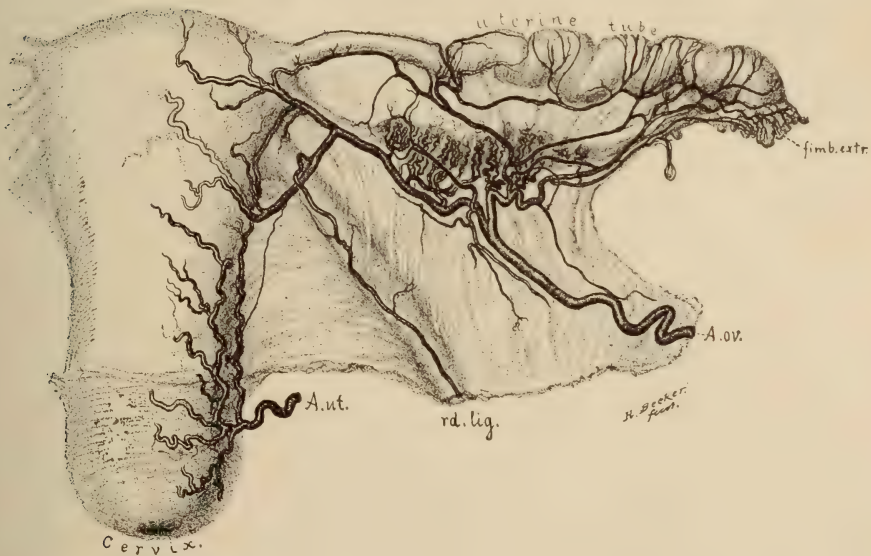


FIG. 14.—Ovary of new-born child showing the gross relationship of the ovarian artery to the ovary and tube and to the uterus. (Clark.)

puberty. The maturation of primordial follicles goes on from earliest life, the follicles not rupturing, but undergoing atresia, until, by the deposit of connective tissue in the medullary portion and the penetration of the blood-

vessels to the cortical areas, the follicles then begin to undergo development (Figs. 13-19).

The Uterus.—At birth the cervix is disproportionately large, making up more than one-half of the organ. Its wall is much thicker and better developed than the fundus. The fundus is less rounded than in the mature uterus, and the uterine angles merge directly with the tubes, suggesting previous fusion of the Müllerian ducts. The mucosa of the cervix, with its arborvitæ-like arrangement, extends up into the fundus. The position of the uterus

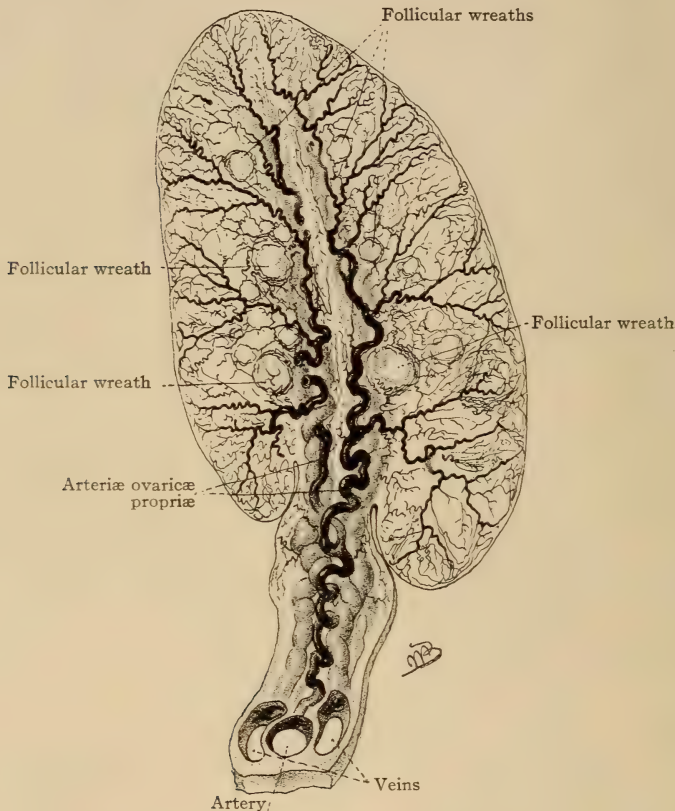


FIG. 15.—Ovary of a child two years old. The vessels have become more tortuous, and numerous follicles lying next to the parallel arteries are in the process of evolution. (Clark.)

is high, the fundus being opposite the fifth lumbar vertebra. During childhood the organ descends into the pelvis, the cervix and body assume mature proportions, the fundus becomes arched, and the mucosa of the cervix becomes sharply differentiated from that of the fundus (Fig. 20).

The Fallopian Tube.—At birth the Fallopian tubes are long, twisted, tortuous, and the fimbriated extremities are poorly developed. During childhood they grow shorter, many of the convolutions disappear, and the fimbriated extremities attain their full development.

The Vagina.—At birth the vagina is long and narrow; its walls are

thick, and the rugæ extend to the vaginal vault. As the uterus descends it diminishes in length, the fornices widen, and the rugæ in the upper portion disappear.

EMBRYONIC RESTS AND THE NEW
FORMATIONS ORIGINATING IN
THEM

In the generative organs of the adult female there are seen rests or remnants of certain embryonal structures that served their purpose in early fetal life, but later, after the embryo had been fully formed, became functionless and underwent atrophy. These fetal remnants are represented in the Wolffian tubules and the Wolffian duct (Fig. 1, *e*).

Embryonic rests are found principally in certain localities, as, for example, in the broad ligament between the tube and the ovary, in the ovarian hilus, at the cornua of the uterus, at the sides of the uterus and cervix, at the lower pole of the kidney, in the vault of the vagina or in the anterior vaginal wall as far forward as the external urinary meatus, in the rectal wall, and in the round ligament.

The most conspicuous remnant of the Wolffian body and duct is the parovarium, a structure embedded between the layers of that part of the broad ligament known as the mesosalpinx. It consists of a series of atrophic tubules, a long longitudinal and numerous vertical ones, resembling the back and teeth of a comb. The longitudinal tubule of the parovarium,

known as Gärtner's duct, is a remnant of the Wolffian duct; it is discernible almost to the cornua of the uterus. Rests may also be found microscopically along the sides of the uterus, cervix, and in the lateral vaginal walls. From the outer extremity of Gärtner's duct there occasion-

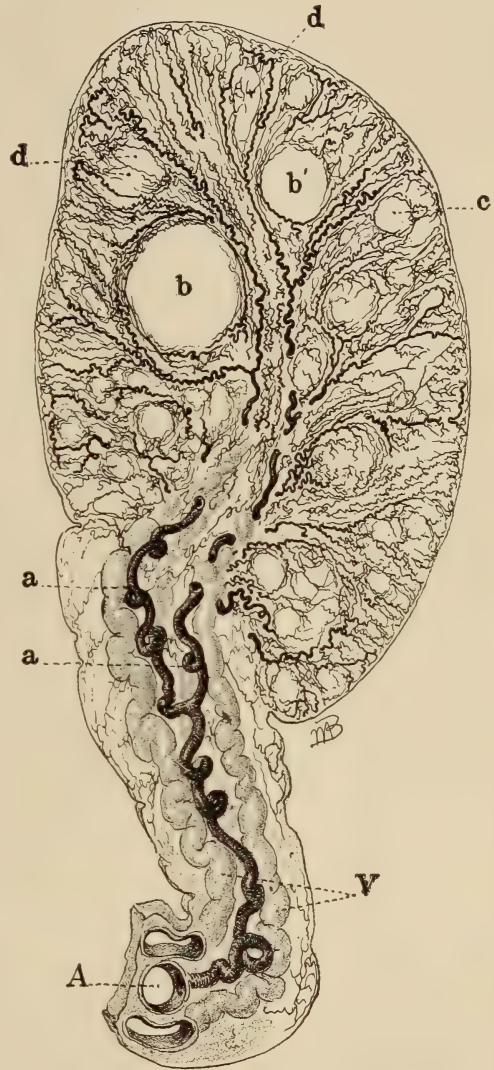


FIG. 16.—Ovary of a girl nine years old. Increase in tortuosity of vessels and progressive enlargement and obliteration of follicles toward periphery. *d, d'*, vascular loops which have surrounded follicles undergoing obliteration. (Clark.)

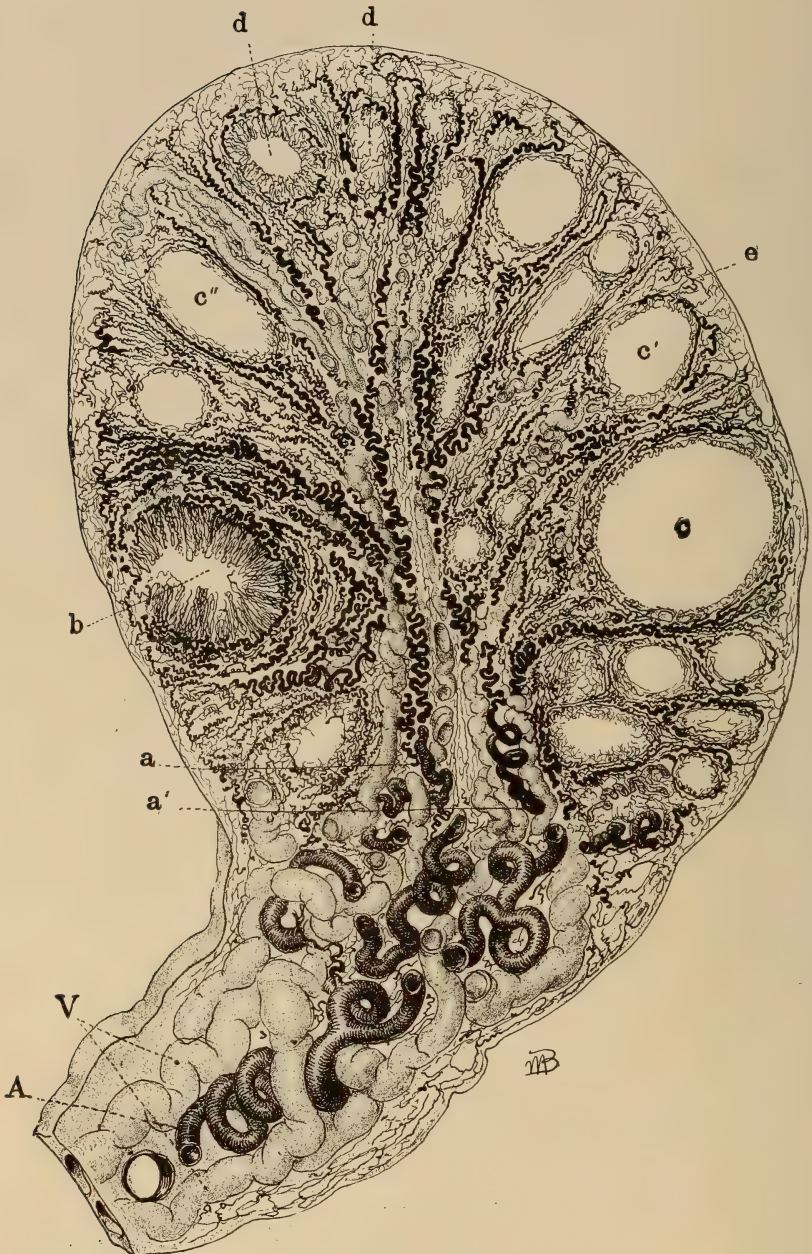


FIG. 17.—Ovary of a girl sixteen years old: (a) (a') arteriæ parallelae ovarii; (b) typical organizing corpus luteum; (c), (c'), (c'') different stages in the maturation of the follicle; (d), (d') stages in the obliteration of the follicle which has not ruptured; (e) complete retrogression, the central vessels of the hyaline body having almost completely disappeared. (Clark.)

ally develops a small, pedunculated cyst known as the *stalked hydatid of Morgagni*. From the lower extremity of the duct are derived a certain type of adenomyoma of the cervix and the majority of vaginal cysts.

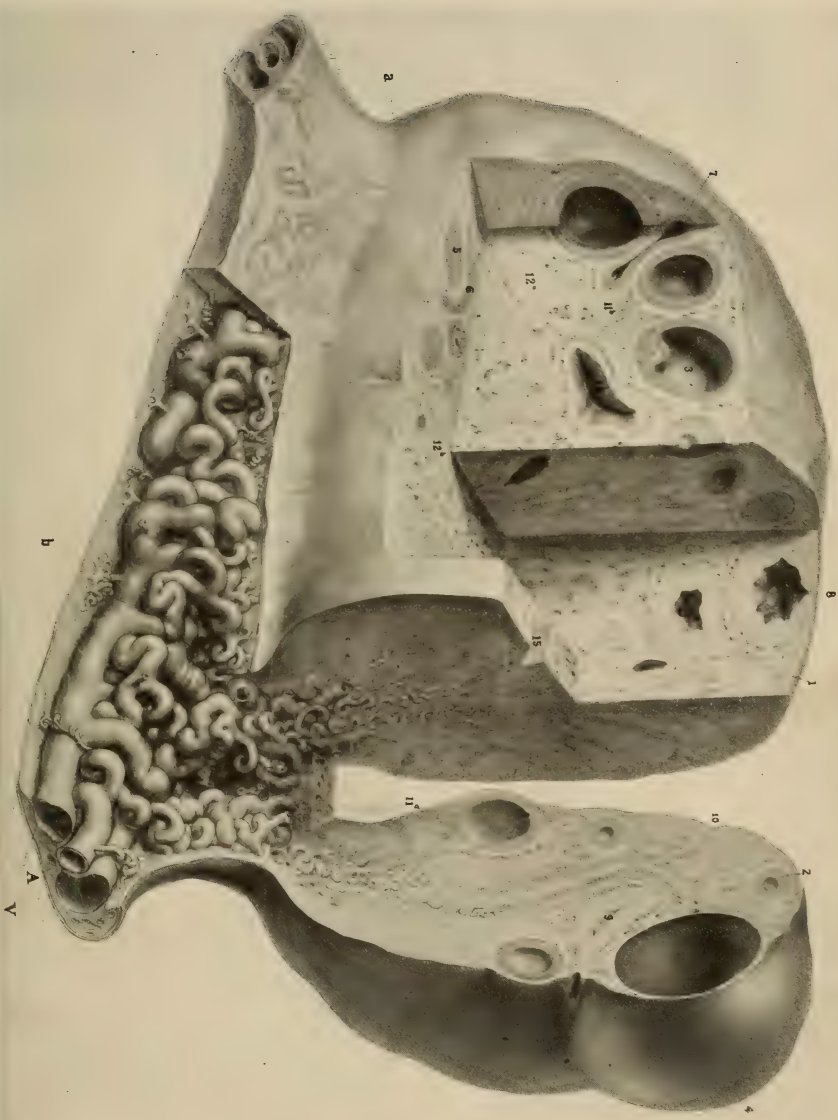


FIG. 18.—Reconstructive drawing representing the ovary of a young woman in active menstrual life, made from a large series of injected normal ovaries: A, V, arteria ovarica, vena ovarica. a indicates the original line in the embryo at which the peritoneal has been transformed into the germinal epithelium. (Waldeyer's line). b, capillaries found in the peritoneum from small branches of the hilus vessels. 1, 2, 3, 4, progressive stages in the evolution of the follicle, beginning with the primitive, in which there is follicle surrounded with a few granulosa cells, and progressing through the series to the mature follicle which is on the point of rupture. 5, dome of follicle showing granulosa cells; 6, crescentic follicle; 7, follicle squeezed between two growing ones; 8, recently ruptured follicle; 9, corpus luteum in completely organized; 10, 11a, 11b, further stages of degeneration of corpus luteum; 12a and b, forms of hyaline bodies; 13, cystic follicles; 14, hyaline bodies with cystic change; 15, corpus fibrosum. (Clark.)

The outer vertical tubules of the parovarium, known as Kobelt's tubes, give rise to small cysts about the size of grapes. The other tubules are the

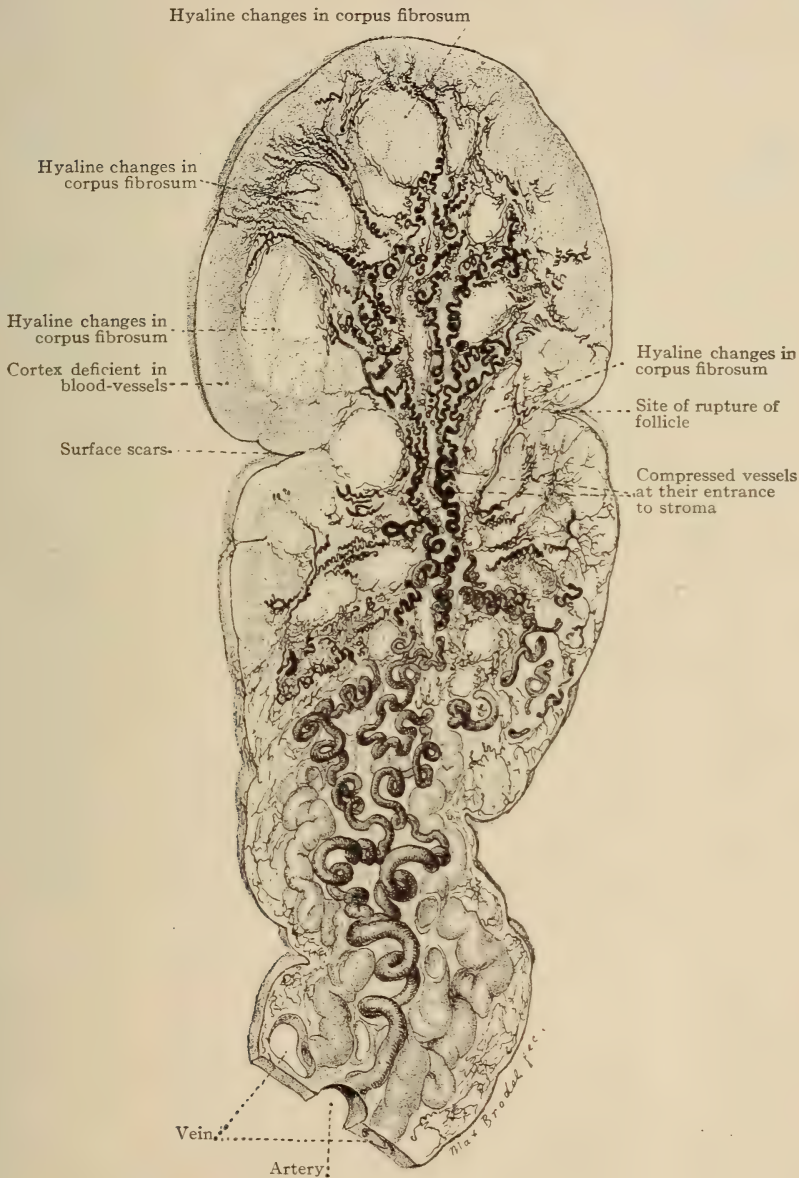


FIG. 19.—Ovary of a woman forty-two years old. Death occurred shortly after the menopause. (Clark.)

seat of well-known intraligamentous parovarian cystomata, which sometimes reach very large proportions.

Other remnants of the Wolffian tubules may be found between the

layers of the broad ligament, as well as in the hilus of the ovary itself. From these develop the true glandular cystomata of the ovary, the most common variety of ovarian cyst (Fig. 21).

Some authorities assert that embryonal rests of the Wolffian tubules at the lower pole of the kidney, in the broad ligament, at the uterine cornua, and in the round ligament, may give rise to adenomyomata in these situations. Others have shown that most of the adenomyomata that develop in the uterus are derived from the Müllerian ducts in the process of evolution of the uterine body and endometrium. Oscar Frankl has observed in the

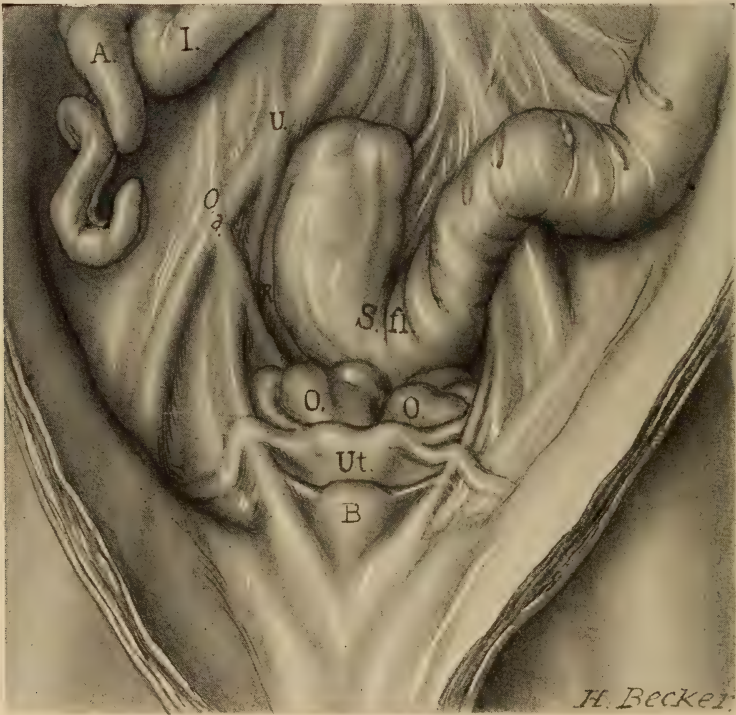
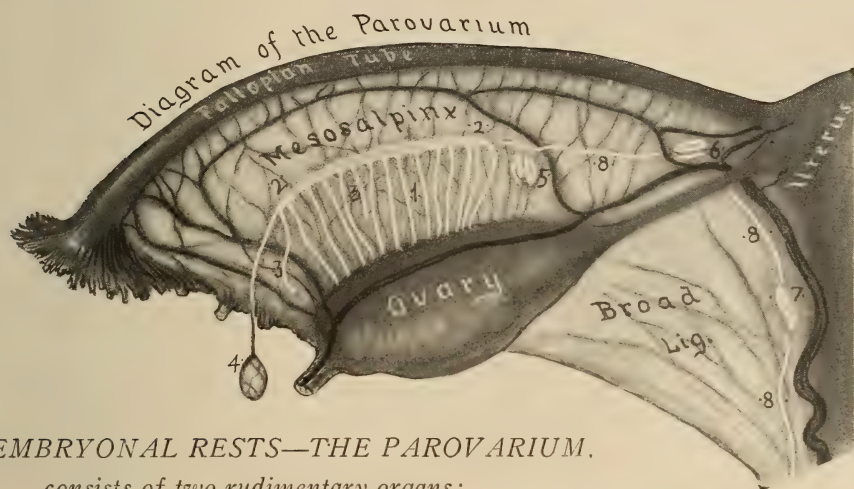


FIG. 20.—Contents of the pelvis in an embryo of three and one-half months (X4): abdominal wall pulled downward; (A) appendix; (I) ileum; (U) ureter; (O.A.) ovarian artery; (S.Fl.) sigmoid flexure; (O) ovary; (Ut.) bicornuate uterus; (B) bladder

broad ligaments cornified nodes of epithelium derived from the Wolffian bodies. From these rests epidermoid cysts may spring.

In the early stage of development aberrant cells from the ovum (mulberry mass) may become detached from the other cells and subsequently become embedded in any part of the body. They are especially prone to be found as rests in the genito-urinary system, since this forms so large a portion of the early embryo. These aberrant cells may subsequently develop and give rise to tumors containing derivatives from any or all the layers of the blastoderm. The most common of these growths are the so-called dermoid cysts of the ovary (see Chapter XX).

Rests of suprarenal tissue may be found in the inguinal canal, the round ligament, and the fundus of the uterus. Their presence is due to the close proximity of the adrenal glands to the sexual organs during the period of development. From such embryologic remains hypernephromata may develop.



EMBRYONAL RESTS—THE PAROVARIIUM.

consists of two rudimentary organs;

1st THE EPOOPHORON (THE ORGAN OF ROSENMÜLLER)

(equivalent to the epididymus in the male) consists of a number of epithelial lined tubes 1; remains of tubules of the Wolffian body, ascending from the ovary and ending in the Wolffian (Gärtner's) duct 2-2; remains of tubules 3-3 sometimes forming hydatids; terminal bulb 4 hydatid cyst of Morgagni:

2d THE PAROOPHORON 5 (EQUIVALENT TO THE PARADIDYMUS IN THE MALE);

6-7 epithelial lined remnants, others are occasionally found in body of uterus, cervix and vaginal wall, and are sometimes the seat of cysts; 8-8-8 atrophied remains of Wolffian (Gärtner's) duct.

[From standard authors and specimens in Doctor Clark's collection.]

FIG. 21.—Fallopian tube and ovary, showing mesosalpinx and embryonic rests therein. Schematic view of structures in the broad ligament.

BIBLIOGRAPHY

- CLARK, J. G.: "Histogenesis of Glandular Cysts of the Ovary." Tr. Am. Gyn. Soc., 1903, xxviii, 312-322.
 CULLEN, T. S.: Adenomyoma of the Uterus. Saunders, Phila., 1908.
 ELLIS, E. G., WITH KEEN, W. W., AND PFAHLER, G. E.: "On Hypernephroma." Am. Med., 1904, viii, 1039.
 FRANKL, OSCAR: "Pathologische Anatomie und Histologie der Weiblichen Genitalorgane," in Liepmann's Handbuch der Frauenheilkunde. Band ii, Vogel, Leipzig, 1914.

- KEIBEL, FRANZ, AND MALL, E. P.: Manual of Human Embryology. Lippincott, Phila., 1910.
- KOLLMANN, J.: Handatlas der Entwicklungsgeschichte des Menschen. Fischer, Jena, 1907.
- KOLLMANN: Lehrbuch der Entwicklungsgeschichte. Fischer, Jena, 1898.
- PICK, L.: "Ist das Vorhandensein der Adenomyome des Epioophoron erweisen." Centralbl. f. Gynäk., 1900, xxiv, 389-397.
- PIERSOL, G. A.: Human Anatomy. Lippincott, Phila., 1907.
- RECKLINGHAUSEN VON, F. D.: Die Adenomyome und Cystadenome der Uterus- und Tubenwandung. Im Anhang: Klinische Notizen zu den volumösen Adenomyome des Uterus. Freund, Berlin, 1896.
- THUMM, L.: "Ueber die adenomatöse Hyperplasie am cervicalen Drüsenanhang des Gärtner'schen Ganges. (Nebst Mittheilung eines einschlägigen Falles.)" Archiv f. Gynäk., 1900, lxi, 15-36.
- TUTTLE, J. P.: Diseases of the Anus, Rectum and Pelvic Colon. Appleton, N. Y., 1907.

CHAPTER II

THE DEVELOPMENTAL ANOMALIES OF THE GENERATIVE ORGANS

The Ovary.—Complete absence of both ovaries is seen only in monstrosities. The absence of one ovary is quite unusual, but has been found associated with defect of one Müllerian duct. The kidney of the same side may be absent. Rudimentary or poorly-developed ovaries often co-exist with the various malformations of the uterus. Rudimentary ovaries are usually small, but may be almost normal in size. They contain few, if any, primordial follicles. So-called supernumerary ovaries are merely portions of the ovaries snared off by peritoneal bands or adhesions, or small fibromyomata of the ovary in the broad ligament.



FIG. 22.—Uterus unicornis.

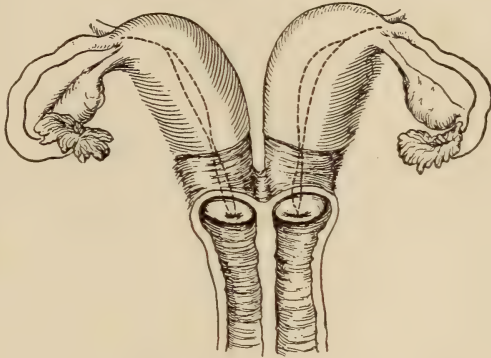


FIG. 23.—Uterus didelphys (uterus duplex separatus; vagina duplex separatus).

The Fallopian Tubes.—Complete absence of both tubes occurs only in monstrosities. The absence or partial development of one tube is coincident with a similar condition of the corresponding uterine horn. The convoluted fetal type may persist, even in the adult. Supernumerary or double tubes are very rare. Accessory tubes and accessory abdominal ostia are not infrequent. Diverticula from the mucosa into the wall of the tube are common.

The Uterus.—It is only necessary to bear in mind the successive steps in the development of the uterus in order to understand the various malformations that may arise. The Müllerian ducts at first are solid strands throughout their entire length, with the exception of the upper extremity, which is hollowed out. Later on these strands become possessed of lumina, and join one another at the site of the future cervix. Union of the two above the cervix, as far as the fundus follows, and the intervening and approximated septa then disappear, although atrophy of the septa is not so rapid as outside fusion. At first the uterus so formed is somewhat flattened on top, but at the end of intrauterine life the fundus has developed, forming the

fœtal type of uterus, which is succeeded by the infantile and then by the virginal type.

Complete failure of both Müllerian ducts to develop is found only in monstrosities. Many reported cases of complete failure were really cases of rudimentary development. Complete defection of one Müllerian duct (*uterus unicornis*) (Fig. 22) is usually associated with an absence of the corresponding ovary, kidney, and ureter, and occurs in non-viable fetu, many of the

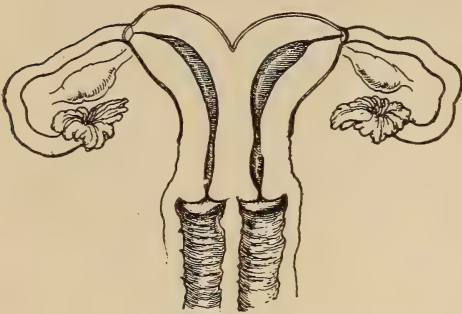


FIG. 24.—Uterus pseudodidelphys (uterus bicornis septus, vagina septa).

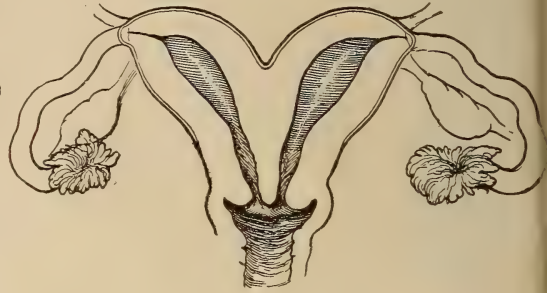


FIG. 25.—Uterus duplex bicornis.

cases described in adults being really instances of high-grade uterus bicornis septus with vagina septa, one side being rudimentary to an extreme degree (Figs. 22, 24 and 29).

The two Müllerian horns may unite at the cervix, the septa between them remaining intact, and no fusion of the two sides above the cervix taking place, thus forming the *uterus duplex bicornis* (Fig. 25). This abnormality is found in well-developed adult females, and, together with the bicornate

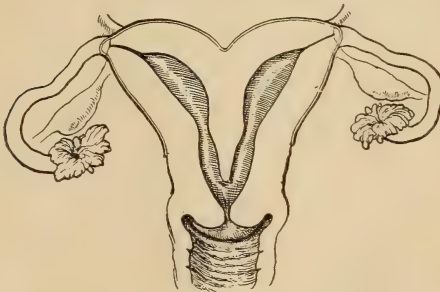


FIG. 26.—Uterus duplex septus.

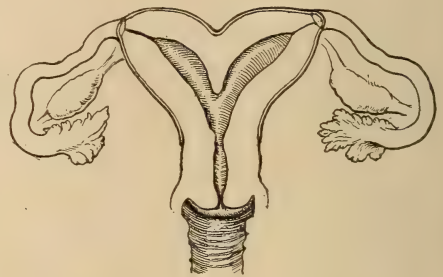


FIG. 27.—Uterus duplex subseptus.

uterus, constitutes the most frequent form of uterine anomalies. As a rule, two vaginal canals surrounded by a common sheath exist, their orifices being guarded by a common hymen. The vaginal septum may extend either the entire distance from the cervix to the introitus or only part of the way. The two uterine horns are seldom equally well developed. In these cases menstruation and pregnancy may take place normally. Hæmatometra may arise in the less well-developed side, and this may also tend to obstruct labor.

The Müllerian ducts may develop and fuse from the cervix to a point

near the fundus, the intervening septum as far as the external os persisting. In this way is formed the *uterus duplex septus* (Fig. 26); the vagina may be double or single. The septum may not extend to the external os, and when this occurs the condition is known as *uterus duplex subseptus* (Fig. 27). As a rule, menstruation is normal, and pregnancy and labor may occur in either or in both sides at the one time.

When the Müllerian ducts unite at the position of the cervix to the full normal extent, the intervening cervical septum having disappeared, but fail to fuse above this point, the condition is termed *uterus bicornis* (Fig. 28). One horn may be smaller than the other (Fig. 29), or may be imperforate, although furnished with a functioning endometrial cavity. The underdevelopment of one side may be so marked that the condition will resemble the uterus unicornis. In the latter case the undeveloped half of the uterus is represented merely by a thin, band-like or rounded cord, having no cavity, and joining the fully-developed horn at about the site of the internal os. Occasionally in these cases the ovary is present, and the tubes are recognizable as connective-tissue strands having more or less well-developed fimbriæ. In some cases neither the tube nor the ovary can be found.



FIG. 28.—Uterus bicornis.

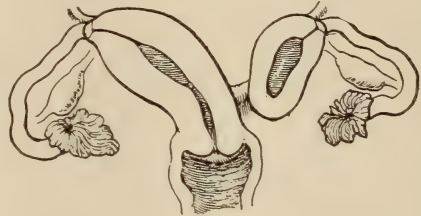


FIG. 29.—Uterus bicornis, with dwarfing of one horn.

A form of maldevelopment marked by *congenital dwarfing* of the entire uterovaginal tract, affects most often the uterus bicornis. At the site of the uterus in these cases there is seen a flattened or rounded body, from one to three centimetres long, the upper extremity of which is continued on both sides in the form of strands. The cervix and the lower part of the uterine horns may be relatively well developed. The ovaries are always present, but are usually of small size. The tubal fimbriæ not infrequently are well formed. The mons pubis and the labia majora contain little fat. The labia minora are frequently well developed. The clitoris may be hypertrophied and hypospadias may be present, the parts presenting the appearance of a malformed male. The vagina is usually obliterated entirely.

The uterus may show a persistence of the fetal type—the *uterus fatalis*. It is considerably shorter than the normal adult form, cylindric in configuration, the fundus being flattened. The cervix is often as long as the body, and the small corpus is very sharply anteflexed upon it. The walls of every part are thin, but the cervix is better developed than the fundus. The vaginal cervix is less prominent than the normal, and projects but slightly into the vagina. The external os takes the form of a round pit or a fine transverse

slit. The uterine cavity is always present, and the ovaries are of the infantile type. The tubes are fetal in form, and are supplied with fimbriæ. The vagina is usually abnormally short and narrow, although it may be normal. The mons pubis and the labia majora are not prominent, but the clitoris and especially the labia minora are well developed.

The uterus may be relatively smaller than the normal virginal type. It is usually known as *uterus infantilis*, or congenital smallness of the uterus, the condition being the result either of defect at birth or of serious constitutional illness in the earlier years of life which arrested the growth of the organ.

Certain congenital malpositions of the uterus occur, such as *latero-position*, when the uterus is drawn either toward the right or toward the left wall of the pelvis; or the organ may occupy an oblique position, so that the vaginal cervix is directed or curved to one side, whereas the body is directed or bent toward the other side.



FIG. 30.—Double vagina and double cervix.

These conditions must be attributed to unequal development of the ligaments. The most frequent deviations that are met with in young women are due to malposition, the result of failure of a proper balance or tension in the ligamentary suspension of the uterus in the pelvis. *Retroversion* and *retroflexion* of the uterus are frequently found in the foetus and in the new-born infant, and congenital prolapse associated with spina bifida has been described. The uterus may also

at birth be the seat of a sharp ante flexion, frequently associated with a small and conical cervix. Stenosis of the cervix may occur, or the cervix may be arrested in its development, even though the remainder of the genital tract is well formed. There may be congenital elongation of the cervix. The various forms of malposition and development defects become manifest only at puberty, when menstruation is established.

The Vagina.—Complete absence of the vagina (*defectus vaginæ*) is generally confined to non-viable monstrosities; in other apparent cases the vagina is represented by a rudimentary cord. The external genitalia may appear to be normal. *Double vagina* is very rare (Fig. 30). A *unilateral vagina* is generally associated with a unicornate uterus. The canal is narrow, and runs to one side of the median line.

Atrësia or *stenosis* of the vagina may be congenital or result from injury.

Complete congenital atresia occurs only in association with arrested development and atresia of the other branches of the Müllerian ducts (Fig. 31, *a*). As a rule, when the uterus is normal, congenital atresia of the vagina affects but a limited portion, and appears as a membranous closure of the lower end of the canal. Occasionally the upper third of the vagina is reduced to a sinus no larger than the cervical canal, the portion of normal calibre ending suddenly at a distance of an inch or more from the cervix. Atresia of a major part, associated with otherwise normal genitalia, is usually acquired, and may be due to bruising or laceration during coitus or labor, or to vaginitis complicating gonorrhea, scarlet fever, diphtheria, typhus or typhoid fever, measles, cholera, and small-pox in early life. It may also follow faulty use of the pessary or be due to caustic, burns, scalding, and various diseases, such as

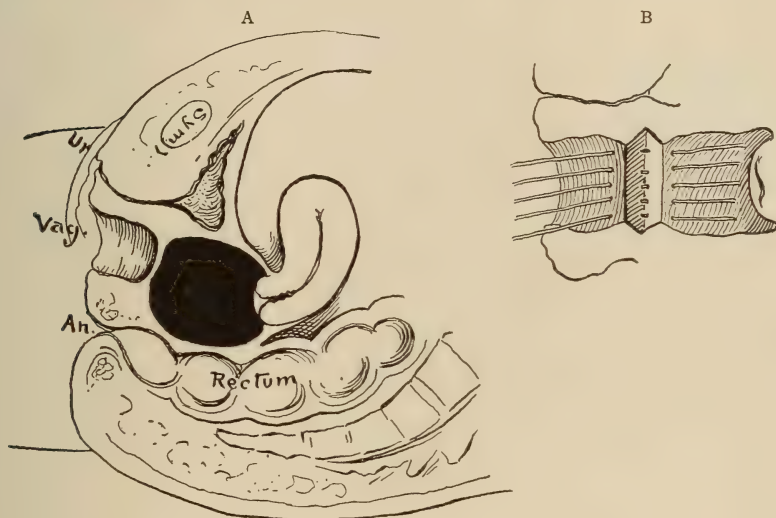


FIG. 31.—(A) atresia of vagina; (B) showing manner of closing wound after removal of obstructing septum.

lupus, syphilis, cancer, gangrene, etc. True atresia of the vagina must be distinguished from simple cohesion of the vaginal walls, analogous to the condition sometimes observed affecting the smaller labia. The vaginal walls may be adherent throughout their entire length, but a simple digital examination will usually suffice to separate them.

A *septate vagina* (Fig. 24) is one in which a fusion of the two Müllerian ducts in the vaginal area has not occurred. When the condition is well marked, the uterus is usually double, septate, or bicornate. Sometimes it is unicornate, with a second rudimentary horn, the corresponding half of the vagina being also rudimentary. The uterus may likewise be single, and communicate with but one of the vaginal canals, the other ending in a cul-de-sac. Both sides of the vagina may, however, communicate with a single uterus, the septum extending the entire length of the vagina, from the hymen to the fornix, its upper extremity being unattached. As a rule,

the two canals lie side by side, one of them, usually the left, being a little in front of the other. One canal is usually a little larger than the other. The septum varies in thickness, and may be the seat of perforations; it often displays considerable mobility, being easily displaced to one side, and thus escaping observation. The septum may also be short and band-like, or may run diagonally. Occasionally it takes the form of a mere projecting ridge on the vaginal wall. Associated with a vaginal septum may be a double vulva, but, as a rule, this is single. The hymen is usually single, although it may have two openings. Abnormal openings between the vagina and the rectum or the vagina and the urethra may be present. These are generally due to malformation of the vulva, the remains of the cloaca or of the urogenital sinus tending to persist.

The Hymen.—*Atresia* is the most frequent malformation of the hymen.

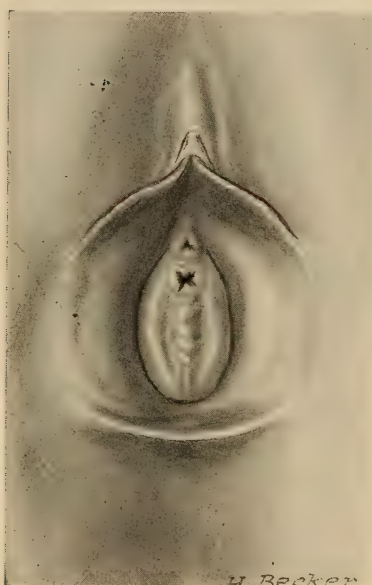


FIG. 32.—Nearly imperforate hymen.
(Case of Dr. J. Whitridge Williams.)
Woman pregnant.

When the remainder of the genital tract is normal, atresia is usually acquired, and is the result of inflammation. *Double hymen* may occur in association with a double vagina, and is rarely seen otherwise. With the ordinary vaginal septum the hymen is single. Many variations in form occur; thus it may be crescentic or cribriform; it may be sculptured; the opening may be exceedingly small (Fig. 32), or the hymen may be represented merely by a few poorly-developed papillæ. Hypertrophy, abnormal rigidity, or abnormal elasticity of the hymen may be present. Cysts are rare, and usually congenital. They may have their origin in the coalescence of hymenal folds, in distended lymph-spaces, in embryonal rests, or in sebaceous glands. Tumors of the hymen, such as sarcoma, angioma, and polyp, have been described.

The Vulva.—All evidences of the vulva may be absent (*atresia* or *defectus vulvæ*) in non-viable feti. In these cases the bladder,

genital canal, and rectum communicate, and are greatly distended with urine. The skin is stretched evenly and unbrokenly from the pubis to the coccyx, and from one tuberosity of the ischium to the other. No perineal septum may be formed, so that the anus opens into the vestibule. This is the result of an arrest of development beginning at the stage when the openings of the rectum, bladder, and genital tract were common and undifferentiated. An *infantile vulva* is usually associated with poorly-developed internal genitalia and a generally weak systemic development; it is often associated with chlorosis. The labia are small and flat. The introitus is shallow and narrow. A *double vulva* is very rare. Hypertrophy of the clitoris and of the labia minora and adhesions of the prepuce of the clitoris and of the labia minora may be present. The adhesions between the smaller labia may be due to vulvitis

occurring in early life as a complication of gonorrhœa, pneumonia, measles, scarlet fever, diphtheria, dysentery, or typhus fever.

The Bladder and Urethra.—*Complete absence* and *duplication* of the bladder are possible malformations, but are extremely rare. A persistent patency of the urachus may result in the formation of a *vesico-umbilical fistula*. The *urachus* may be the seat of a *cyst* of large size, resembling an ovarian or a parovarian cyst. *Epispadias*, a defect due to fissure or an absence of the upper wall of the urethra, may be present, although it is not so common as in the male. The bladder may be normal, but is usually involved. Associated with this condition there may be a permanent separation of the two halves of the symphysis pubis and a median fissure of the anterior abdominal and bladder walls. The bladder is usually smaller than normal, and may appear as a red, slightly congested mucous surface prolapsed through the cleft (*exstrophy of the bladder*). The clitoris and the labia minora and majora are divided, the halves lying on each side of the opened urethra. Occasionally the labia may be absent.

Hypospadias is a congenital defect of the lower wall of the urethra. It may be partial in degree or complete, as when the urethrovaginal septum is entirely absent. Associated with this condition there may be a failure of development of the perineum and a persistence of the cloaca. If the hypospadias is simple—as is usually the case—the perineum is present.

Malformations of the Ureter.—The most frequent abnormality of the ureter consists in a duplication of the duct. It may be unilateral or bilateral, and partial or complete. Congenital absence of a kidney is usually accompanied by an absence of the corresponding ureter. Partial stricture or complete occlusion may occur in conjunction with an atrophic or cystic kidney. There may be an abnormal communication of the ureter with the vagina, rectum, urethra, or vestibule.

Malformations of the Kidney.—The kidney of one side may be absent or rudimentary in structure, the accessory organs of the same side being also usually defective. The kidney may be of the fetal type, or small and lobulated. Absence of both kidneys is, of course, incompatible with life, and is found only in monstrosities. Various forms of fused kidneys are found, the commonest being the *horseshoe kidney*, in which the upper or lower poles are fused, forming a half-moon-shaped organ; or the lower pole of one kidney may be fused with the upper pole of another kidney, one organ lying directly above the other, or the fused kidney may be represented by a flat, disciform, cake-shaped body.

Malformations of the Anus and Rectum.—Complete absence of the anus is rare. An *imperforate anus* is due to a persistence of the anal membrane separating the ectoblastic indentation from the rectal pouch (Fig. 1, *b*). Stenosis of the anal canal, causing obstruction or constipation, may occur in an anus that presents a normal appearance externally. The anal opening may occupy an abnormal position in the sacral, lumbar, or pubic regions. Imperfect or incomplete fusion of the anus and rectal pouch may give rise to partial occlusion of the rectum. Failure of the two canals to unite, with varying degrees of separation, may occur. Such a condition may simulate an absence of the

rectum, the true condition being revealed only at operation. The rectum may communicate abnormally with the vagina, uterus, or other viscus, whereas the anus may be normal.

PSEUDOHERMAPHRODISM

Considered in its literal sense, the term "hermaphrodite" is applied to an individual who possesses perfect male and female generative organs. Although the condition has been observed in some species of vertebrates, in man the existence of true hermaphroditism has not been clearly established, since in most of the reported cases the details of microscopic examination



FIG. 33.—Gynatresia. Bulging imperforate hymen, simulating large cystocele. Same case as Fig. 34. (Bryn Mawr Hospital.)

of the sexual organs have been lacking. Clinically, we are concerned chiefly with establishing definitely the sex of one in whom developmental defects of the external genitalia bring about a close resemblance of the organs to those of either sex. In 90 per cent. of the reported cases the condition is one of male pseudohermaphroditism, hence it is advisable that in doubtful cases the male sex should be assumed to exist.

Female pseudohermaphroditism is a condition in which the ovaries are the essential sexual organs, the external genitalia and breasts, however, being imperfectly developed, and the habits, voice and pelvis being of the masculine type. The clitoris is enlarged, resembling the penis, and adhesions of the labia and labial ovarian hernia simulate the scrotum and its

contained testes. In these cases, owing to lack of development of the ovaries, menstruation may be absent. As is frequently the case, the ovaries may be located in the inguinal region, when they may resemble imperfectly descended testes.

Male pseudohermaphroditism, as has been stated, constitutes the vast majority of cases of pseudohermaphrodites. The essential sexual organs, the testes, are present, but are poorly developed and often undescended. General male characteristics are absent, and the voice and figure, especially the mammary development, conform more closely to the female type. The ill-developed external genitalia resemble those of a woman. The penis is small, often held down by a frenum, and the urethra opens on the under surface (hypospadias). The scrotum may be deeply furrowed and resemble the labia. In extreme degrees the short vestibular canal may be guarded by a membrane closely resembling the hymen, and in some cases a uterus may be present, giving rise to an occasional sanguineous discharge resembling menstruation. In such cases the testes are incapable of producing spermatozoa, and, as a rule, pseudohermaphrodites are sterile. The removal of a sexual gland for the relief of pain or for some pathologic condition will afford an opportunity for microscopic examination and permit definite conclusions as to the sex to be made.



FIG. 34.—Gynatresia. Imperforate hymen. Distention of vagina and uterus by retained menstrual fluid—abdominal tumor. (Bryn Mawr Hospital.)

Gynatresia is a complete stenosis of any part of the uterovaginal canal. After puberty, if any functioning endometrium is present, an accumulation of menstrual blood takes place above the point of obstruction. Stenosis may be present in an otherwise perfectly-formed uterus and vagina, or in double formations of the different types.

The symptoms of gynatresia appear only after puberty, and consist of menstrual molimina without the escape of menstrual fluid. Severe, cramp-like pains with a tendency to bear down may be present. After a time the accumulated secretion causes a dilatation of that part of the genital tract in which it is confined, and forms a cystic tumor (Figs. 33 and 34). Ordinarily, the suffering is so great and the development of the tumor so prompt, that surgical aid is sought within a few years after puberty, although cases are on record that have gone on for many years. The severity of the symptoms is naturally dependent upon the physiologic activity of the

ovaries producing the menstrual impulse, and upon the degree of development of the endometrium, to which the amount of menstrual fluid is directly proportionate. The simplest form of gynatresia is that which results from an imperforate hymen. In this condition the accumulating menstrual fluid

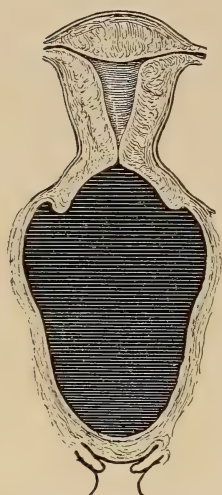


FIG. 35.—Hæmatocolpos.

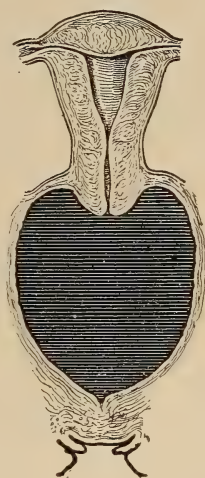


FIG. 36.—Hæmatotrachelos; hæmatocolpos.

first distends the vagina (*hæmatocolpos*) (Fig. 35), and later, if the atresia is not relieved, the uterus. At first the cervical canal is involved (*hæmatotrachelos*) (Fig. 36), and finally the body of the uterus (*hæmatometra*) (Fig. 37) is affected. The distended uterus preserves its hour-glass form for a long period, owing to the resistance to distention at the internal os. The uterine wall is either over-stretched and thinned to a marked degree, or the distention of the uterine cavity may be accompanied by hypertrophy of the uterine walls. The menstrual fluid forces its way out into the tubes, and their abdominal ostia become occluded by a localized peritonitis induced by the escape of the

fluid onto the pelvic peritoneum. The tube then in turn becomes distended, forming a *hæmatosalpinx* (Fig. 38).

Gynatresia may affect one side of a double or bicornate uterus (Figs. 39 and 40). It is usually found in connection with rudimentary development of one side. If malformation of the uterus is associated with malformation of the vagina, the cystic tumor may affect both the uterine horn and the

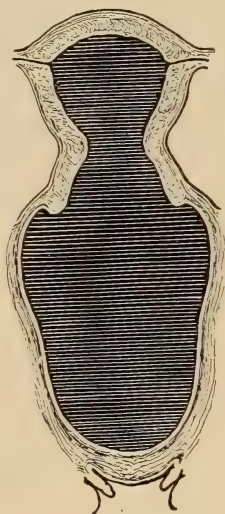


FIG. 37.—Hæmatometra; hæmatotrachelos; hæmatocolpos.

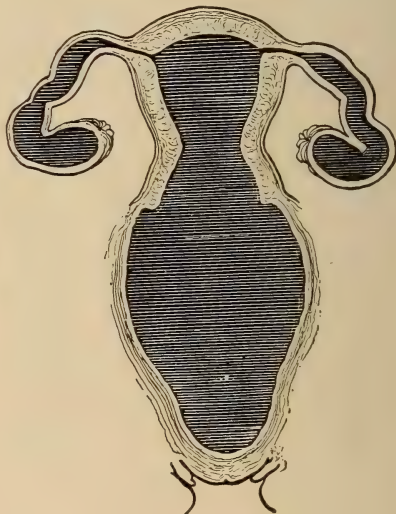


FIG. 38.—Hæmatosalpinx; hæmatometra; hæmatotrachelos; hæmatocolpos.

corresponding vaginal half. The tube on the affected side may also be the seat of a *hæmatosalpinx*. The retained fluid is thick, almost black in color, and of tar-like consistency. In long-standing cases inflammatory complications may ensue, and a *hæmatosalpinx* is frequently complicated by chronic pelvic peritonitis with adhesions. The encysted blood may become infected either

by continuity from the adjacent intestine, or by way of the blood-stream, in the case of hæmatocolpos and hæmatometra, or infection may be secondary to spontaneous rupture of the occluding hymen and partial evacuation of the retained fluid.

THE DIAGNOSIS OF MALFORMATION OF THE GENERATIVE ORGANS

Abnormalities of the external genitalia are easily recognized. The diagnosis of **malformations of the ovaries and tubes** by physical examination is very often quite impossible, and one is forced to rely on the general indications of a defective ovarian activity. Incomplete ovarian development is manifested by an absence of the ovarian stimulus to the general system at the time of puberty. The change in configuration does not take place, the individual retaining the physical characteristics of childhood. Various neuroses may develop, anæmia is often present, and the general nutrition is poor. Hypertrichosis may be present. When the ovaries are rudimentary, severe pain referred to the ovarian region may occur at the time of menstruation. **Faulty development of the uterus and vagina**, the ovaries being affected coincidentally or not, may manifest itself in the form of amenorrhœa, dysmenorrhœa, sterility, or impotence. Double malformations, in the absence of atresia, may remain undiscovered until pregnancy or labor makes a pelvic examination necessary.

Malformations of the uterus and vagina may be divided into two large groups: (1) Those due to arrested development, and (2) those due to double development.

Arrested Development of the Uterus and Vagina.—There may be simple atresia of the vaginal orifice, or the vaginal canal may be undeveloped throughout its entire length. A rectal examination, made with a sound in the bladder, will serve as a means of differentiating between the two conditions. If the vagina is rudimentary, a few fibrous cords will be felt between the rectum and bladder. In simple occlusion after the age of puberty, the vagina is distended with blood, unless the generative organs are so deformed as to prevent a menstrual flow (see *Gynatresia*). The vagina may be occluded at a higher point, so that externally a short cul-de-sac may be observed. The distinguishing features between simple membranous occlusion and complete lack of development above this point are as follows: a rudimentary uterus may be recognized by making

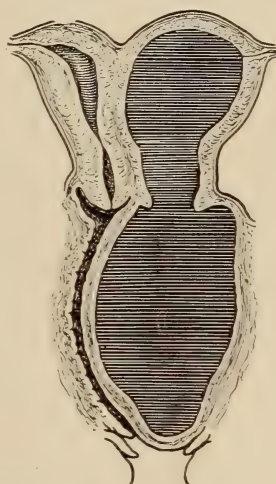


FIG. 39.—Gynatresia of one-half of double uterus and double vagina. Hæmatometra; hæmatocolpos.

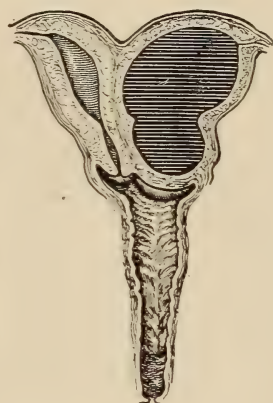


FIG. 40.—Gynatresia of one uterus and hæmatometra in double uterus.

careful bimanual examination with one finger in the rectum. A small body may be felt in the median line, with thin, cord-like branches running on either side to the pelvic wall. On the other hand, nothing may be palpable in the median line, the lateral parts of the rudimentary bicornate uterus being made out by manœuvres similar to those employed in picking up the ovaries and tubes. The lateral rudiment may often be mistaken for an ovary, and can be distinguished from the latter only by locating both the rudiment and the ovary of the same side. Complete absence of the uterus in the adult is extremely rare. When the uterus remains in its fetal or infantile state of development, the external os may open directly into the vaginal vault, the vaginal cervix being barely perceptible. The length of the endometrial cavity may be determined by means of a sound, which will also afford some measure of information as to possible endometrial function. The entire uterus may have a length of from 4 to 5 cm. Puberty is delayed for several years. The intermenstrual periods may be prolonged from several months to a year. The menstrual flow may appear for a day, or even for only an hour, and be accompanied by severe dysmenorrhœa. Vicarious menstruation has been observed. The cervix is usually ante-flexed. The subject is of a nervous, unstable temperament. Conception rarely occurs, but is possible, especially after artificial dilatation of the cervical canal. Labor is marked by inertia uteri.

Double Formation of the Uterus and Vagina.—If gynatresia is absent, no symptoms present themselves, and the condition remains unrecognized until pregnancy or abortion makes a pelvic examination necessary. Menstruation, pregnancy, and labor may occur as when the uterus is normal. When pregnancy takes place in one horn, the other becomes slightly enlarged. Labor may be complicated by weak contraction of the pregnant horn, or the unimpregnated horn, or a septate vagina may present an obstacle to the descent of the head. If the uterus is double but the two horns are not equally developed, and especially if one is atresic, the condition will become apparent soon after puberty by the development of symptoms of gynatresia. Double or septate vagina may be easily recognized if there is a double introitus; but if one side is rudimentary, the septum being considerably to one side of the median line, the condition is not readily recognized and may escape observation. Some difficulty may be experienced in recognizing septa situated high in the vagina. Whereas a double vagina is usually an indication of a double uterus, a double cervix invariably means a double uterus—*uterus didelphys* or *uterus bicornis duplex*. In *bicornate uteri* the cervix is generally single, the division between the two horns beginning above the external os. An attempt at diagnosis may be made by introducing the finger into the cervix, if this is patulous, or by passing two sounds, one being deflected to the right and the other to the left. Furthermore, bimanual pelvic examination will usually reveal broadening and furrowing of the uterine fundus. Double uteri may simulate a myomatous uterus, differentiation being made only with difficulty. A uterus with one horn (*uterus unicornis*) may be suspected when the organ lies with its fundus directed to one side of the median line, the body being long and thin, and the fundus being of neither normal size nor roundness, but taper-

ing toward the tube. It may occupy a nearly transverse position. There is always a rudimentary or undeveloped horn, which may be felt on the side opposite to the uterus, and may be mistaken for the ovary or for a myoma. It is generally understood that a true single-horned uterus is not found in the adult, the real condition being one of double or bicornate formation, one side being rudimentary to an extreme degree.

Diagnosis of Gynatresia.—If hæmatocolpos is present, there is a bulging outward of the hymen between the labia (Fig. 33), and a bluish discoloration is apparent. When the cystic tumor also involves the uterus, the distended fundus may be felt as a semi-cystic tumor extending above the symphysis. Hæmatosalpinx in conjunction with hæmatometra is not easily detected. In order to determine the condition of the tubes an examination should be made, preferably by the rectum, under anæsthesia, and with great gentleness. Palpation will reveal the presence of sausage or retort-shaped cystic masses on one or both sides of the uterus. Gynatresia associated with *double formation of the vagina and the uterus* sometimes presents the greatest difficulties in diagnosis, since, as the fluid accumulates, the distended uterine horn and vaginal portion lose all their original relations. The shape of the cystic tumor is approximately round or oval. It forms an elastic or firm mass, which is often quite sensitive and may be adherent to the surrounding structures. Its relation to the undistended horn and vagina depends upon the extent and nature of the malformation. Thus an accumulation of menstrual fluid in a rudimentary horn may be situated at such a distance from the developed horn that the examiner may mistake it for an ovarian tumor; on the other hand, an atresia of one-half of a uterus didelphys or a fully-developed uterus bicornis will result in the formation of a tumor that is closely connected to the other half of the organ. In uterus septus the retention tumor occupies a part of the uterus itself, and the empty half can be recognized only by the aid of the sound. When the vagina is double and one side is atresic, but is in communication with one side of a deformed uterus, a fluctuating tumor lying to one side of the median line may reach nearly or quite to the vulva.

THE TREATMENT OF MALFORMATION OF THE GENERATIVE ORGANS

Atresia of the labia minora, the result of cohesion during early life, may be treated successfully by gentle separation of the parts, the pressure of a finger or the use of a probe generally being all that is required (see Diseases of the Vulva). Hypertrophy of the clitoris, labia minora, and prepuce may be dealt with surgically, the excess of tissue being removed, and the wound being closed by a suitable plastic operation. An imperforate hymen associated with hæmatocolpos should be excised. A rigid hymen may require forcible divulsion under anæsthesia, or, in extreme cases, excision may be necessary.

Epispadias and hypospadias, if not too marked, are amenable to operative measures, and if the condition is associated with incontinence of urine, surgical treatment should always be attempted. A defective urethra may be restored by uniting freshly denuded adjacent surfaces over a sound, just as in similar operations on the male. In extreme cases of epispadias asso-

ciated with exstrophy of the bladder relief may be obtained by excising the bladder and implanting the ureters with their vesical orifices into the rectum. In extreme cases of hypospadias the operation must be similar to that performed for marked cases of vesicovaginal fistula.

Vaginal adhesions resembling those that form between the labia minora may sometimes simulate true atresia. In such cases separation may usually be effected by the finger or a probe, the surfaces being held apart by packing or a suitable plug. When partial and limited in extent, vaginal atresia may be relieved by surgical measures. The atresic area should be excised, and the mucosa of the vagina above united to the mucosa of the vagina below, in order to insure continuity of the vaginal tube (Fig. 3I, *b*).

If the atresia is complete, and if it is associated with imperfect development of the internal genitalia, so that no menstrual fluid accumulates, operation should not be undertaken. If the condition is discovered after marriage, the question of operative interference becomes more pertinent, and operative measures to restore the vagina may be undertaken.

The operation for complete atresia consists, first, in making a dissection between the rectum and the bladder up to the site of the cervix, the procedure being carried out following careful palpation per rectum with a sound in the bladder. When communication has been established between the cervix and the vulva, the opening should be enlarged as much as possible, by means of dilators. An attempt may be made to form a vaginal mucosa by transplanting flaps of skin from the adjacent parts of the vulva or buttocks. Suitable packing, glass or silver plugs, or repeated dilatation may be employed in the endeavor to keep the newly-formed vagina open, but, as a rule, the operation is not followed by good results. Baldwin's plan of making an artificial vagina consists in transplanting an excised loop of ileum still attached to its mesentery, into a space created by dissection between the rectum and the bladder. For the details of the operation the reader is referred to the original articles of Baldwin. Stewart and Marshall report favorable results following this operation in expert hands. Twenty-two cases have thus far appeared in the literature, and the results have been generally satisfactory. No deaths occurred.

Vaginal septa should be excised, the procedure being usually carried out without any difficulty. The dividing septum should first be split through its entire length, and then each half should be removed by cutting through its attachment to the vaginal walls. The linear wound thus made should be closed by a catgut suture.

Complete atresia or stenosis of the cervix requires dilatation of the cervical canal or amputation of the cervix above the site of obstruction. Partial atresia or stenosis is also an indication for dilatation (see *Pathologic Antelexion*). Defective development of the cervix and uterus, whatever the type, is influenced but little by any mode of treatment. The more faulty the development, the less likely is treatment to be of any avail (see *Dysmenorrhœa*). In cases of infantile uterus associated with stenosis of the cervix and antelexion, the introduction of intrauterine pessaries and the intrauterine application of the faradic current have been recommended, but their effectiveness is doubtful. Bicornate or double uteri often require no treat-

ment, for, as has previously been pointed out, these conditions may give rise to no symptoms, menstruation, pregnancy, and labor occurring as in the case of the normal uterus. If, however, one horn is obstructed or undeveloped, it may become distended with retained menstrual fluid or be the seat of a pregnancy. Distention of one horn with menstrual fluid is a form of gynatresia, and its treatment will be described further on. When pregnancy occurs in an undeveloped or a rudimentary horn of the uterus the danger of rupture is great. For this reason the entire uterus, or the affected horn, should be removed as soon as the diagnosis has been made. Painful menstrual molimina without menstrual discharge, or with vicarious menstruation, may be an indication for the performance of bilateral oöphorectomy. This operation is, however, indicated only when the uterus, vagina, and external genitalia are rudimentary or are so poorly developed as to render them entirely useless as organs of procreation. Hermaphroditism is not, as a rule, influenced or benefited by any form of treatment. In certain cases plastic operations on the external genitalia may be undertaken, but in most cases they are void of results. Hermaphroditic children, as stated elsewhere, should always be reared as males.

The treatment of gynatresia depends upon the site of the closure and the extent of the menstrual accumulation. Before puncturing a vaginal or a cervical septum, an attempt should be made to ascertain the condition of the tubes, for if these are distended with blood, puncture alone would be useless and even dangerous. The thick, tarry fluid cannot be evacuated from the tubes in this way, and in spite of every precaution the tubal contents are likely to become infected and may lead to septic peritonitis. If the tubes are distended an exploratory abdominal incision should be made, and if the tubes are found to be badly diseased, they should be removed. If it appears feasible technically and sepsis is not present, the tubes may be opened, irrigated, and drained, and then left *in situ* after new ostia have been fashioned (see Salpingostomy). The site of the atresia may then be punctured from below, and the accumulated fluid carefully removed with pledgets of gauze. As the uterus and vagina are emptied their walls contract. The opening that has been made should be rendered permanent by a suitable plastic operation and the insertion of a glass or metal tube, or by repeated packing. If the cervix was the site of atresia, repeated dilatation of the canal with bougies may be necessary. In some cases it is wiser to amputate the cervix above the site of the atresia. When the tubes are involved and the uterus is malformed, removal of both the uterus and the adnexa is advisable in some cases. Whatever the operation or treatment carried out, the most rigid aseptic technic is required.

THE SURGICAL TREATMENT OF CONGENITAL MALFORMATIONS OF THE ANUS AND RECTUM

In cases of simple occlusion of the anal opening, as by membranous septa, the lower end of the tract is the seat of a more or less decided bulging. After the usual local preparations have been carried out, an incision is made carefully into the sac, and, after the contents have been evacuated, the redundant membranous septum may be cut away and the raw surfaces

covered in with continuous or interrupted catgut sutures. It may be necessary to continue the introduction of an anal dilator or a gauze drain for some time to prevent the formation of a cicatricial atresia. When there is no communication between the anal canal and the lower end of the rectum, end-to-end anastomosis is always to be considered, although the technical difficulties of this operation are great. A simpler plan consists in excising the anal canal, drawing the rectum down, splitting its blind end, and suturing the mucosa to the skin margins. When the rectum has been arrested high in the pelvis, the only guide to the rectal pouch may be a fibrous cord connecting it with the anus. Removing or dividing the coccyx may provide an avenue of access, or if the vagina is present, the approach may be made through this canal. Needless to say, care should be exercised to avoid opening the peritoneal cavity or injuring the bladder. When found, the blind end of the rectum may be brought out at the site of the external incision or the normal location of the anus. The blind end should be opened and the mucosa sutured to the skin margins. In imperforate anus in a feeble child, when the shock of a perineal dissection is likely to prove fatal, the operation of colostomy may be performed. The abdomen is opened, and a loop of intestine is brought up into the wound. But few sutures are needed, the intestine being supported in the wound by a glass rod; later the blind end of the opened gut may be explored with a probe, thus facilitating the formation of a perineal opening. In some instances the rectum may open at an abnormal site, but this usually requires no interference. When the rectum opens into another viscus, plastic operations to meet the particular condition at hand must be devised.

BIBLIOGRAPHY

- BALDWIN, J. F.: "Artificial Vagina by Intestinal Transplantation." *Jour. Am. Med. Assoc.*, 1910, liv, 1362.
- MARSHALL, G. B.: "A Review of the Various Operative Procedures for Correcting Atresia Vaginae." *Jour. Obstet. and Gynec. Brit. Emp.*, 1913, xxiii, 193.
- NAGLE, W.: "Entwicklung und Entwicklungs-Fehler der weiblichen Genitalien." *Veits Handbuch der Gynäkologie*. Wiesbaden, 1897.
- STEWART, F. T.: "Formation of an Artificial Vagina by Intestinal Transplantation." *Ann. Surg.*, 1913, lvii, 210.
- WINTER, G., AND RUGE, C.: *Lehrbuch der gynäkologischen Diagnostik*. Hirzel, Leipzig, 1907.
- WINTER, G., AND RUGE, C.: *Gynecological Diagnosis*, edited by John G. Clark. Lippincott, Phila., 1912.
- See also Bibliography, Chapter I.

CHAPTER III

ANATOMY OF THE GENERATIVE ORGANS

The **perineum** is the region bounded by the pelvic arch, the tuberosities of the ischia, the anterior borders of the gluteus maximus muscles and the coccyx. It may be divided into two triangles by an imaginary line drawn between the anterior borders of the tuber ischii (Fig. 41). The anterior triangle is termed the urogenital, whereas the posterior is known as the rectal triangle. The rectal triangle comprises the ischiorectal fossæ and the



FIG. 41.—The division of the female perineal region into the urogenital and the rectal triangles. (*U*) urogenital triangle; (*R*) rectal triangle. (Semi-diagrammatic after photograph of patient in dorsal position.)

anus; the urogenital triangle embraces the external genitalia, the external urinary meatus, the vaginal introitus, and the perineal body.

The **external genitalia** are those parts of the reproductive apparatus that surround and protect the vaginal orifice. Collectively, these structures are known as the *vulva*. They consist of the mons veneris, the labia majora, the labia minora, the clitoris, the vestibule, the vestibular bulbs, and the glands of Bartholin (Fig. 42).

The *mons veneris* is the anterior portion of the vulva. It consists of a thick mound or cushion of fat, supported by connective-tissue septa, overlying the symphysis pubis. It is covered with a dense skin thickly overgrown with coarse, short hairs.

The *labia majora* are continuations downward, on both sides of the genital cleft, of the tissues making up the mons veneris. Each labium consists of a fold or lip of skin inclosing between its outer and inner surface fatty con-

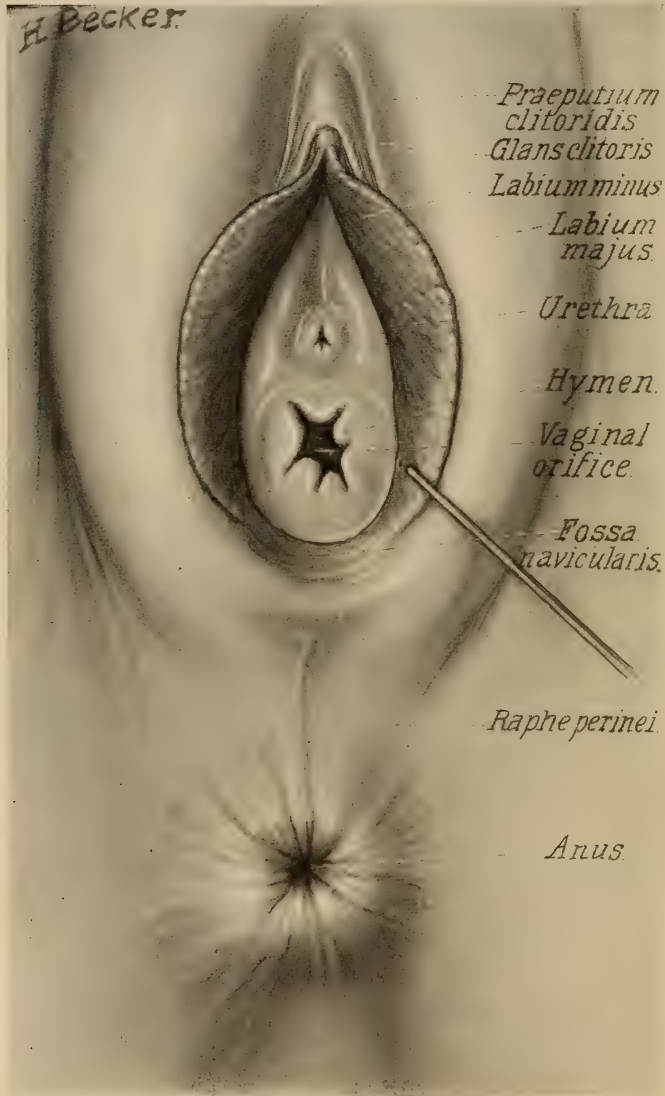


FIG. 42.—Normal vaginal vulva showing component parts. Sound pointing to opening of Bartholin's (vulvovaginal) gland.

nective tissue and a few muscle fibres. The labia extend from the mons veneris in front to the perineal body behind, blending with the latter. Their outer skin is thick and pigmented, and contains numerous short hairs and sebaceous and sweat glands (Fig. 43). The inner cutaneous covering is of more delicate structure, and becomes continuous with the labia minora.

The *labia minora*, or *nymphæ*, are concealed, in the erect posture, by the *labia majora*, with which they run more or less parallel. Anteriorly, each labrum divides into two layers that surround the glans clitoridis, forming a prepuce and a frenum. From the clitoris the nymphæ encircle the orifices of the urethra and the vagina, and bound the portion known as the vestibule. Behind the nymphæ merge into the corresponding greater labium, and are connected to each other by a transverse fold of skin known as the *fourchette*. Both surfaces of the nymphæ are covered with a delicate membrane that resembles mucous membrane in appearance, although it contains no mucous glands (Fig. 43). Numerous sebaceous glands are present on both surfaces, and anteriorly, near the prepuce, sweat glands are seen.

The *clitoris* is the homologue of the penis in the male. It is an erectile organ, formed by the junction of two cavernous bodies, each of which is

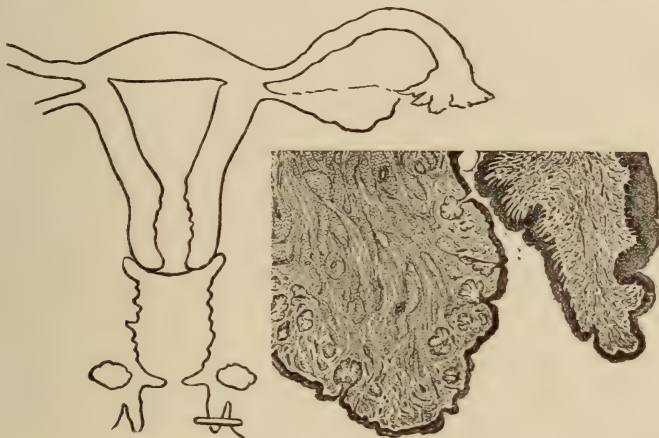


FIG. 43.—Histology of various parts of the genital tract. Accompanying diagrams represent area from which sections were taken. See also figures 46, 53, 54, 55 and 56. Histology of labia of young child. Labia majora on left covered with stratified squamous epithelium showing central fat, hair shafts, and sebaceous and sweat glands in external cutaneous surface. Labium minus on right showing stratified squamous cutaneous epithelial surface covering stratum of loose connective tissue and muscle fibers. (After Piersol.)

attached to the pubic ramus of its corresponding side. The clitoris for the most part lies concealed in the subcutaneous tissues of the lower portion of the mons veneris. Only its extremity is visible as a small conical protrusion known as the *glans clitoridis*. This is situated in the median line, directly behind the mons veneris. Like the penis, it is supplied with a prepuce and a frenum, both of which are formed by the anterior portions of the *labia minora*.

The *vestibule* is the space bounded by the nymphæ, and containing the external urethral and vaginal orifices. On each side, at the lower margins of the external meatus, are the openings of the para-urethral (Skene's) tubules. On each side of the vaginal introitus are the openings of the ducts of Bartholin's glands. The cutaneous covering of the vestibule is of the same delicate structure as that of the nymphæ.

The Glands of Bartholin.—These are situated one on each side of the vaginal orifice, and are embedded in the tissues of the corresponding labium

majus behind the vestibular bulb. They are about $1\frac{1}{2}$ by 1 cm. in size. Each gland has a duct that opens upon the surface of the vestibule, between the nymphæ and the hymen, in the posterior third of the lateral border of the vaginal orifice. The site of the orifice may be marked by a small depression. The opening is very small, and can often be detected only by expressing a portion of the mucous contents of the gland. The gland is of the mucous tubo-alveolar type. The acini, as well as the duct, are lined with columnar epithelium. Near the opening of the duct the epithelium becomes squamous in type.

The para-urethral tubules (Skene's ducts) are two short ducts, 1-2 cm. in length, lined with columnar epithelium and situated one on each side of



FIG. 44.—Vaginal fornices: (P.F.) posterior fornix; (A.F.) anterior fornix.

the posterior wall of the urethra. The tubules open upon a small elevation of the mucous membrane. The orifices are so minute as to be scarcely discernible in some cases. In virgins the tubular openings are frequently concealed by the close approximation of the lips of the meatus; in women who have borne children a certain amount of eversion is present, which exposes the openings. At times instead of a single tubule, a number may be present on each side. These tubules have been regarded as the embryologic remains of the Wolffian duct.

The *vestibular bulbs* are elongated masses of cavernous tissue that are embedded in the tissues of the labia and the lower end of the vagina and urethra. Anteriorly they are in relation with the cavernous bodies of the clitoris. They are analogous to the corpus spongiosum of the male.

The **vagina** is the canal that forms the passageway between the external and the internal genitalia. It is a fibromuscular tube lined with squamous epithelium. It is flattened anteroposteriorly, the anterior and posterior walls being in contact for the middle and greater part of the lower third of its course. On cross-section it presents an H-shaped appearance, the vaginal wall being reduplicated on each side and along the posterior wall in what are known as the vaginal sulci. The

vagina is directed upward and backward from the vaginal introitus. In the erect position its axis forms an angle of about 70 degrees, its general direction being more or less parallel to the line of the superior strait. Its lower part corresponds with the axis of the pelvic outlet. Its upper part surrounds and is attached to the projecting vaginal portion of the cervix uteri. The arched upper blind end of the vagina is known as the *fornix*, or *vaginal vault* (Fig. 44). The cervix projects into the vagina at what is approximately a right angle, so that its anterior attachment to the vagina is at a point further forward than the posterior attachments. This tends to make the anterior wall shorter (7 cm.) than the posterior wall (8.5-9 cm.). The vaginal orifice is narrowed by a fold

of mucous membrane known as the *hymen*. The remains of the hymen after rupture are termed the *carunculæ hymenales*, or *myrtiformes*. The uppermost part of the posterior wall of the vagina, the *posterior vaginal fornix*, is contiguous to the bottom of the pouch of Douglas, and is covered by peritoneum. From the pouch of Douglas to the levator ani muscles the vagina and rectum are brought into close relation by the rectovaginal septum, which is strength-

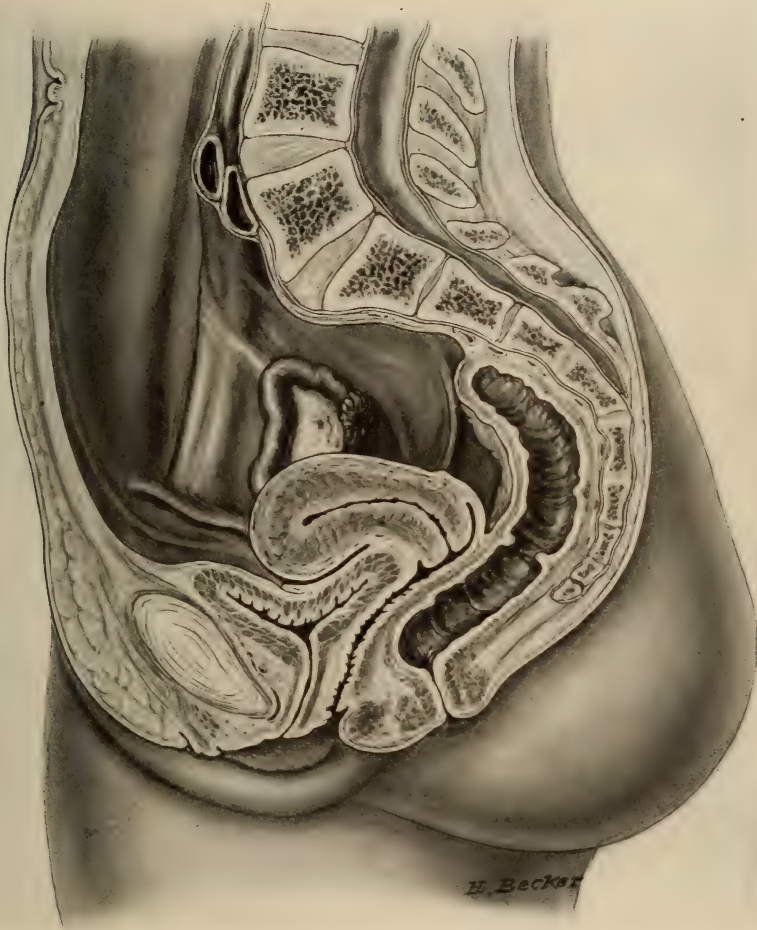


FIG. 45.—Sagittal section through young female body. Bladder empty, rectum slightly distended.

ened by intervening prolongations of the pelvic fascia. Below the rectovaginal septum ends in a wedge-shaped mass of tissue, the perineal body, whose base corresponds to the surface of the perineum and separates the vaginal introitus from the anus. In its upper fourth the anterior vaginal wall is related to the trigone of the bladder; at the level of the lower end of the cervix on each side it is in close relation with the ureters; further down it is intimately connected with the urethra (Fig. 45). At the sides the vagina is

surrounded and supported by the median portion of the levator ani muscles and the pelvic fascia. Near the outlet the vagina is closely attached to the triangular ligament. The vaginal canal is lined with stratified squamous

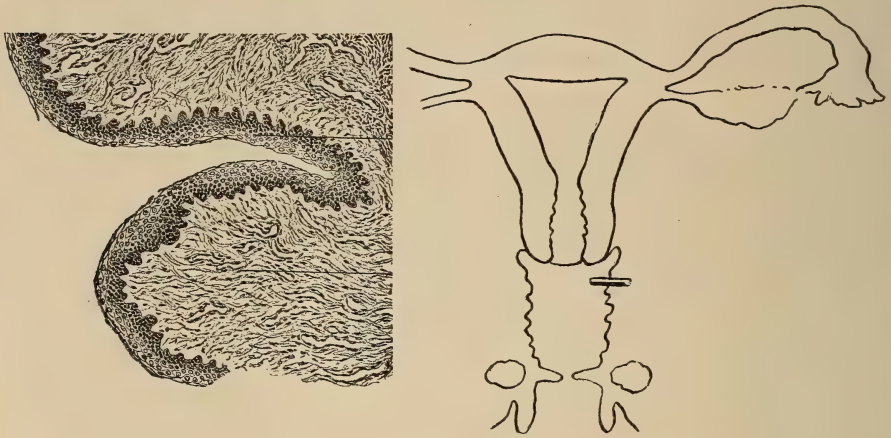


FIG. 46.—Histology of vaginal wall, showing stratified squamous epithelial surface and supporting connective tissue. (After Piersol.)

epithelium, but contains no glands. The underlying connective tissue is beset with numerous papillæ, but under normal conditions these do not affect the smoothness of the surface. Numerous transverse folds or elevations of the



FIG. 47.—Anterior aspect of nulliparous adult uterus, showing peritoneal reflections.



FIG. 48.—Posterior aspect of nulliparous adult uterus, showing peritoneal reflections.

mucosa known as rugæ are observable. Small lymph-nodes are found within the mucosa, especially in the vaginal fornices (Fig. 46).

The uterus is made up structurally of a neck, or cervix, and of a body, or

corpus. It measures 7 cm. in its entire length, of which the cervix constitutes 2.5 cm. Its greatest breadth is about 4 cm., and its thickness about 2.5 cm. In women who have borne children the various dimensions of the uterus are increased about 1 cm., the cervix, however, being relatively shorter than before pregnancy. The upper extremity above the Fallopian tubes is known as the fundus. The anterior surface is more flat and less convex than the posterior surface (Figs. 47, 48 and 49). That portion of the cervix that lies below its attachment to the vagina and projects into the vaginal fornix is known as the *portio vaginalis*; that which lies above the vaginal attachment is known as the *portio supravaginalis*.

The uterine canal begins at the center of the vaginal cervix in the form of a rounded, sunken opening, known as the external os. The cervical canal begins at the external os, and extends to the point of junction of the cervix with the body of the uterus, which is indicated by a contraction of the canal known as the internal os. Between these points, in longitudinal sections, the canal appears to be fusiform, being widest in the middle of its course. The cavity of the uterus is flattened anteroposteriorly, the anterior and posterior walls lying in contact, so that in sagittal sections it appears as a mere cleft (Figs. 50 and 51). When, however, the uterus is divided by a transverse incision, the endometrial cavity is seen to be triangular in shape, the base of the triangle being directed toward the fundus and the apex toward the internal os. The greatest width of this cavity is at the fundus, where it

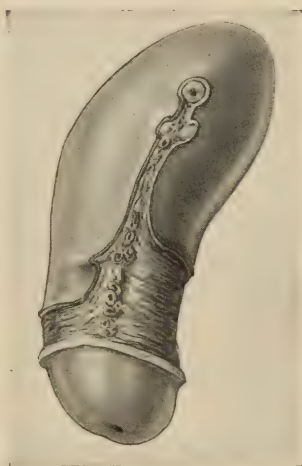


FIG. 49.—Lateral aspect of nulliparous adult uterus, showing peritoneal reflections.

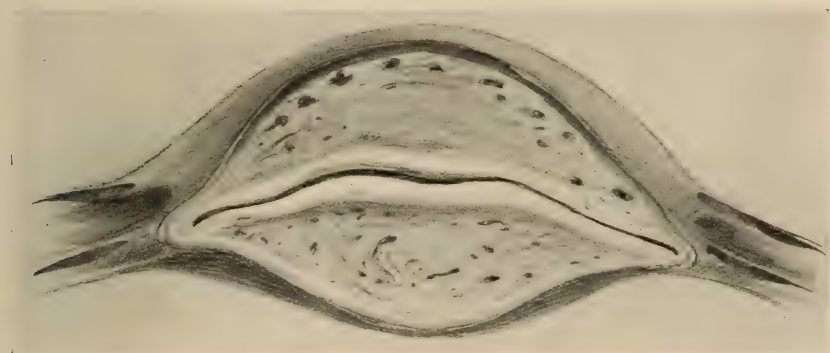


FIG. 50.—Transverse section of uterus at fundus, showing the endometrial cavity and the myometrium at the level of the tubal orifices. (After Waldeyer.)

measures 2.5 cm. In the erect posture the uterus is nearly horizontal, its anterior surface and body resting upon the bladder (Fig. 52). The fundus is elevated and pushed slightly backward by distention of the bladder. The axis of the cervix forms an obtuse angle with the axis of the body. The entire uterus moves forward and backward through an imaginary transverse axis pass-

ing from side to side through the internal os. Whatever moves the fundus backward throws the cervix forward, and *vice versa*. The cervix is more securely fixed in its position than the fundus, and when the uterine muscle is relaxed and flabby, movements of the fundus may not influence the posi-



FIG. 51.—Transverse section of the uterus above the internal os, showing the relations between the endometrial cavity, the uterine muscle and the parametrial tissues. (After Waldeyer.)



FIG. 52.—Para-sagittal section of the pelvis, showing relation of ureter to bladder, cervix, vagina, and rectum. (After Tandler and Halban.)

tion of the cervix, the angle of flexion between the body and the cervix changing constantly. The fundus of the uterus lies a little to the left of the median line. The posterior surface of the uterus is usually covered by the small intestines and the sigmoid flexure. Between the rectum and the posterior surface of the lower uterine segment lies the pouch of Douglas. The

anterior surface of the lower uterine segment is attached to the bladder, the peritoneal covering of the uterus at either side fusing into the anterior and posterior leaflets of the broad ligament.

The mucous membrane of the vaginal cervix is continuous with that of the vaginal fornices, and is of the stratified squamous variety of epithelium. At the external os the epithelium assumes the high columnar type, covering the reduplications of the submucosa and lining the cervical glands and ducts. The cervical glands are of the racemose type. They contain a thick, tenacious mucous secretion. The mucous membrane of the cervical canal is marked by conspicuous ridges or folds consisting of a primary median longitudinal fold, running along the anterior and posterior wall, and numerous secondary folds, running outward and upward from the primary fold (Fig. 53). At the internal os the character of the mucous membrane changes,

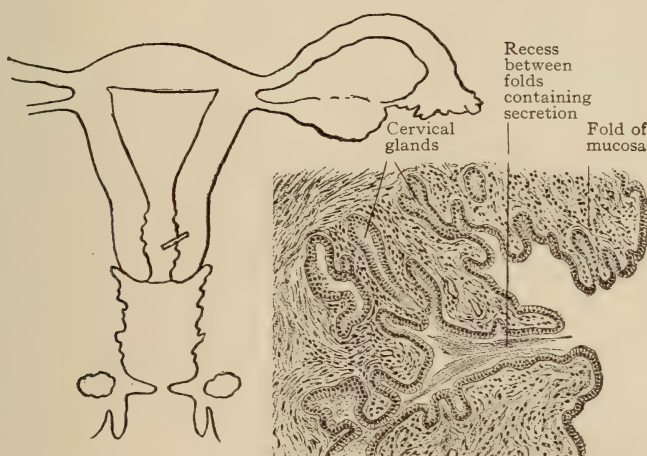


FIG. 53.—Histology of cervix, showing papillary arrangement of cervical folds and high columnar epithelium lining the cervical glands. (After Piersol.)

and from this point upward throughout the uterine cavity a highly specialized mucous membrane, known as the endometrium, extends. The endometrium is about 1 mm. in thickness, and consists of a stroma of small, round, so-called lymphoid cells. It is rich in blood-vessels, and is penetrated by glands that extend from the surface to the deepest part of the endometrium, which is in close relation with the myometrium. Many of the glands penetrate the innermost layers of the uterine muscle (Fig. 54). The endometrial glands are of the tubular variety, and, as a rule, show two branchings in their depths. The lining consists of epithelium of the cuboid type—a continuation of the surface epithelium. The secretion is less thick and tenacious than that of the cervical mucosa. The endometrium is continuous with the cervical mucosa at the internal os, and with the mucosa of the Fallopian tubes at their inner ostia.

The blood-vessels of the endometrium consist of capillaries, and form a rich anastomosis in the superficial stratum of the endometrium beneath the

surface epithelium—the subepithelial capillary plexus. It is from this plexus that the menstrual fluid is derived.

The myometrium is composed of interlacing bundles of muscular and fibrous tissue that form three layers: an outer or subserous layer, whose general direction corresponds to the long axis of the organ; an inner layer, which is disposed in a circular manner about the uterine cavity, and a middle layer, known as the vascular, which is the thickest and most important of the three. In this layer the muscular and fibrous tissue bundles are interlaced, running in every direction, and inclosing between them the veins and arteries, upon which, by contraction, they exert a controlling influence. The outer surface of the uterus, with the exception of the lower

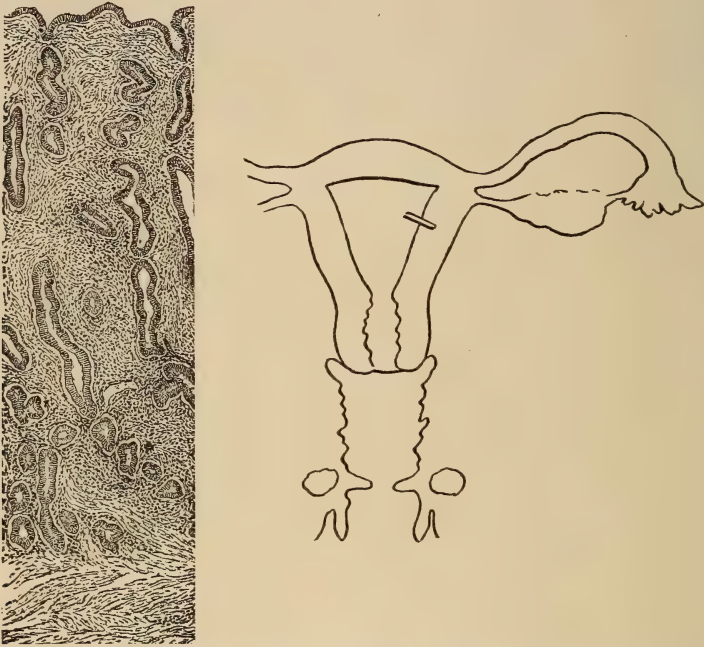


FIG. 54.—Histology of endometrium of body of uterus, showing stroma and the tubular glands lined with low columnar cells penetrating the innermost layers of the uterine muscle. (After Piersol.)

part of the anterior surface of the fundus and the cervix, is covered with peritoneum. The lower anterior limit of the peritoneum is marked by the peritoneal reflection to the bladder.

The Fallopian tubes are fibromuscular canals covered with peritoneum and lined with mucous membrane. They extend from the fundus of the uterus on each side to the corresponding ovary. They are about 11.5 cm. in length. The inner third, or isthmus, is narrow; the outer two-thirds, or ampulla, is broad and expanded. The outer extremity of the tube is open, presenting a trumpet-shaped orifice known as the infundibulum or abdominal ostium. On its outer surface the tube is invested with peritoneum derived from the superior border of the broad ligament, this particular fold of peritoneum being known as the mesosalpinx. The peritoneal coat ends

at the abdominal ostium, where it comes into relation with the mucosa. The mucosa of the tube has a peculiar arrangement: at the uterine end it is composed of a few reduplications of a fibrous submucosa, covered with columnar epithelium; the reduplications increase in number toward the outer extremity, so that a cross-section made at this point shows the tubal lumen to be obstructed with branching, tree-like projections of the submucosa covered with a single layer of columnar cells. At the outer ostium these folds, covered with epithelium, project and form what are known as the fimbriæ. One or two of these are usually longer than the others, and are attached or lie in close relation to the ovary—the ovarian fimbriæ. The tubal mucosa is directly continuous with the endometrium at the uterine ostia of the tubes,

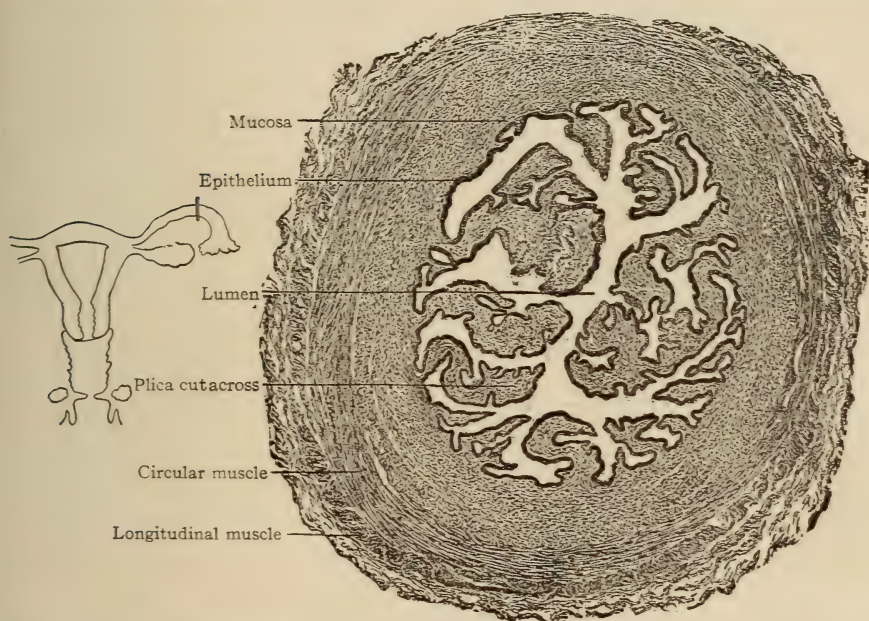


FIG. 55.—Histology of Fallopian tube. Transverse section of tube near outer end of ampulla, showing the tree-like branchings of the plica of the mucosa, the inner circular and outer longitudinal muscle layers. (After Piersol.)

and with the pelvic peritoneum and capsule of the ovary at the abdominal ostium. The middle coat of the tube is made up of muscular tissue arranged in two layers—an outer longitudinal and an inner circular layer (Fig. 55). The lumen of that portion of the tube lying within the uterine wall is 1 mm. or less in diameter, gradually increasing toward the ampulla, where it measures from 2 to 4 mm.; at the abdominal ostium it is from 4 to 6 mm. in diameter. The outer diameter of the tube at the isthmus is between 3 and 4 mm., whereas at the ampulla it measures from 6 to 8 mm.

The tube passes from the uterus toward the ovary, encircling the latter, its fimbriated extremity being in relation usually with the lower and back part of the median surface. The ovary is also partly enveloped by the mesosalpinx, the peritoneal reflection in which the tube is inclosed. Viewed from above, the ovary is often concealed by these structures. The close

approximation of the mesosalpinx, forming a sort of pocket, and the proximity of the fimbriated extremity facilitate the entrance of the fecundated ovum into the Fallopian tube. These relations may, however, be disturbed by malpositions of the uterus or by the interposition of portions of the intestines.

The ovaries, or sexual glands, are oblong, almond-shaped, solid bodies attached to the posterior surface of the broad ligament. Their average dimensions are 36 by 18 by 12 mm., although they vary in size from time to time with the development and rupture of the Graafian follicles. The area of attachment to the broad ligament is along the anterior border of the ovary, a portion known as the hilum. Although the peritoneum of the pos-

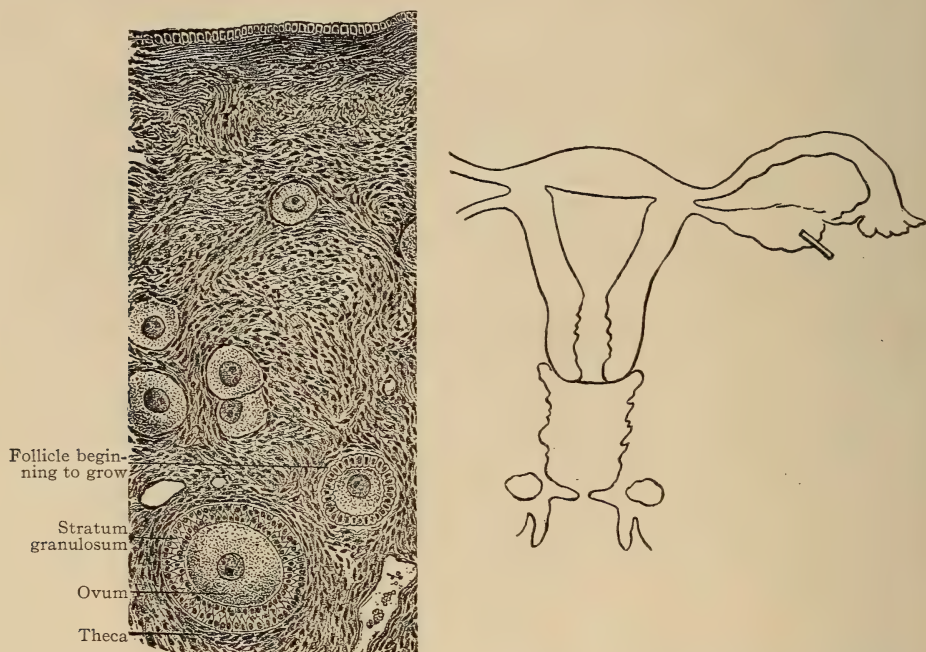


FIG. 56.—Histology of ovary, showing surface epithelium, and follicles in various stages of development within the ovarian stroma. (After Piersol.)

terior surface of the broad ligament immediately surrounds the area of ovarian attachment, it is not continued over the surface of the ovary itself, so that the capsule of the organ is in direct relation with the peritoneal surfaces of the pelvis and the ovary is intraperitoneal.

The ovary is suspended vertically by the infundibulopelvic ligament, a derivative of the broad ligament, which passes outward over the external iliac vessels to the fascia covering the psoas muscles. Within this ligament lie the ovarian vessels and nerves. The inner or lower pole of the ovary is attached to the posterior surface of the body of the uterus, behind and below the isthmus of the tube, by the utero-ovarian ligament. This is enveloped by the peritoneum covering the posterior surface of the broad ligament. The ovary is made up of a fibrous tissue stroma that contains resting or developing ova (Fig. 56). The resting ova are seen in large numbers in the

peripheral zone of the organ. They develop one by one, forming Graafian follicles that rupture and discharge the ovum, the site of the follicles being filled in by a temporary structure known as the corpus luteum, which is succeeded in turn by hyaline bodies termed the corpora albicantia. These structures are all usually found at one time in the adult ovary, in various stages of development or retrogression. The core or central portion of the ovary is the vascular area. The capsule is formed by a condensation of the fibrous stroma, and presents a dull white, lusterless appearance. Under the microscope, here and there in depressions of the surface, low cuboidal cells—the germinal epithelium—are seen.

The Bladder.—The bladder occupies a position between the uterus and the symphysis pubis (Fig. 52). It lies in contact with the space of Retzius in front, loosely attached to the cervix behind, and between them in close relation with the anterior vaginal wall, to which its base is intimately attached. The apex of the bladder is free. This is the portion that rises as the viscus fills with urine. When distended the bladder is pyriform in shape. As the urine is voided the apex or movable portion sinks into the base, a fixed part, just as one saucer fits into another. A sagittal section made at that time shows the organ to be triangular in outline, the base being directed upward, stretching between the uterus and the symphysis, and covered with peritoneum; the anterior side is seen to be attached to the symphysis, and the posterior side is fused with the anterior vaginal wall. Viewed from above, the peritoneal surface of the bladder presents a cordiform outline, the base stretching in front of the uterus mesially and on either side of the broad ligament, the two sides curving gently forward toward the symphysis pubis. The urethra emerges from the bladder at its lowest part, the internal urinary meatus, which forms the apex of a triangular area known as the trigone, the three points of the triangle consisting of the internal urinary meatus and the two ureteral orifices. This is the most fixed portion of the bladder, being intimately attached to the anterior vaginal wall. Although the mucosa covering the parts of the bladder which distend is thin and without rugæ, the mucosa of the trigone is thicker and is thrown into ridges or folds that converge from the base of the trigone—the interureteric line—toward the apex—the internal urinary meatus.

The average capacity of the normal bladder is 430 c.c., although it has been known to have a capacity of 750 c.c. Under pathologic conditions, the bladder may hold as much as three or four liters of urine without rupture.

The body of the uterus rests upon the superior surface of the bladder; it rises with the distention and falls with the evacuation of that viscus.

The Urethra.—The urethra is from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in length, and runs directly from the apex of the bladder to the external urinary meatus. It is intimately associated with the anterior vaginal wall. At the point where it leaves the bladder it is surrounded by circular muscular fibers—the vesical sphincter. The external meatus is slightly contracted, but possesses no sphincter.

The Ureters.—The ureters are tubes, one on each side, which connect the renal pelvis with the bladder. They are about $10\frac{1}{2}$ inches long, the left being slightly longer than the right. The diameter of the tube varies in

different parts of its course, but the average is between 4 and 5 mm. In the abdominal cavity the ureter descends from the kidney pelvis, beneath the peritoneum, overlying the psoas magnus muscle to the pelvic brim, where it is about $1\frac{1}{16}$ inches from the median line of the lumbosacral promontory. A little above the pelvic brim the ureter crosses the iliac vessels at about the point where the division into the external and internal iliac arteries takes place. It then follows the course of the internal iliac artery, running parallel with but posterior to it, until it reaches the pelvic attachments of the broad ligament, where it leaves the internal iliac and penetrates the connective tissue of the ligament from behind forward, curving from the pelvic wall toward the median line. It passes beneath the uterine artery and reaches

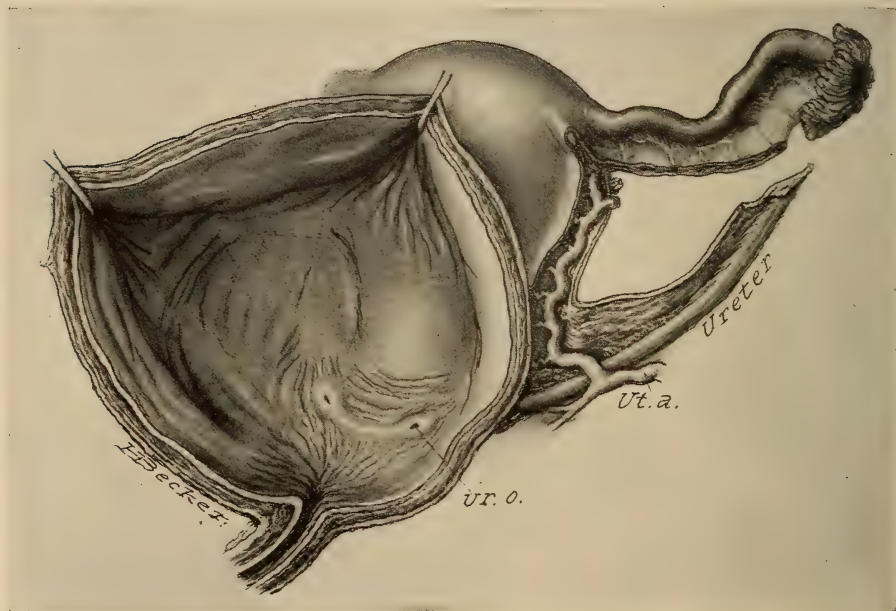


FIG. 57.—Interior of bladder and relation of ureter to uterine artery, showing trigone, ureteral orifices and internal urethral orifice; also the intimate relation of the ureter and uterine artery. (*Ut.a.*) uterine artery; (*Ur.o.*) ureteral orifice.

the cellular space between the cervix, anterior vaginal wall, and bladder. It pierces the vesical wall obliquely, and empties into the bladder at the ureteral orifice (Fig. 57).

The ureter receives its blood supply from the small branches of the renal and ovarian arteries, and from a special artery from the internal or common iliac, or from the aorta. In the pelvis the middle hemorrhoidal or the inferior vesical contributes branches whose twigs produce a network that supplies the ureteral wall.

The pelvic ureter is surrounded by a sheath derived from the tissue along or through which the ureter passes. If, during operations, the integrity of the sheath is preserved, that of the ureter is assured. Separation of the ureter from its sheath deprives it of an adequate blood supply, and

subjects it to the danger of ureteral necrosis. The position of the ureters as they approach the cervix and lie in intimate relation with the uterine artery and vaginal and vesical wall is of considerable importance surgically (Fig. 57). Approaching the uterine artery and uterovaginal junction from the abdominal side, they lie below and to the outer side, and if the uterus is pulled forcibly up and toward the median line, the distance between the uterus and the ureters is increased.

In vaginal operations the position of the ureteral orifices in relation to the anterior vaginal wall may be ascertained by selecting a point from 5 to 6 cm. from the external meatus, in the midline. This corresponds to the position of the base of the trigone. The ureteral orifices are situated 1 to 1.25 cm. to either side of the median line. In vaginal operations, when the anterior fornix is divided and the cellular tissue between the vagina, cervix, and bladder is exposed, the ureters are carried up out of the operative area as the bladder is pushed off from the cervix and elevated by suitable retraction. The distance between the cervix and the ureter is also increased if the cervix is pulled down with a tenaculum.

The Rectum.—The rectum lies behind posterior to the uterus and vagina. It is separated from the uterus and from the fornices of the vagina by Douglas' cul-de-sac. The rectum is the terminal portion of the large intestine. It takes its origin in a point opposite the third sacral vertebra, or where the mesentery of the sigmoid flexure terminates. The rectum follows the curve of the sacrum and the coccyx to a point slightly below the top of the latter, where it meets and ends in the anal canal. The anterior wall of the rectum in the lower part, *i.e.*, the part not covered by peritoneum, is intimately connected with the posterior vaginal wall. The lowest portion of the rectum, at the position of its junction with the anus, abuts upon the perineal body. With the anal canal the rectum forms nearly a right angle.

The rectum is divided into three sacculations or pouches by the rectal valves. The latter are ridges or folds that project from the gut into its lumen; they are caused by a folding or turning in of all the coats of the bowel covering two-thirds of its circumference. The largest of these pouches or sacculations is the lowest, which is known as the ampulla. The first valve can be felt at about a finger's length from the anus, and at a point almost opposite the posterior vaginal fornix. The anus is situated deeply between the folds of the nates, about two inches from the tip of the coccyx. In repose the orifice appears as a longitudinal slit, the skin surrounding the aperture being pigmented and thrown into folds or corrugations by the contraction of the external sphincter. The anus is separated from the vaginal orifice by the perineal body. The external sphincter muscle is intimately associated and blended with the fibers of the levator ani muscle, which surround the lower portion of the rectum. The fibers of the levator ani decussate with those of the middle coat of the intestine.

The Pelvic Peritoneum.—The peritoneum of the anterior abdominal wall is continued downward into the pelvis. In front it is reflected over the apex of the bladder and the anterior surface of the uterus, to the upper half of which it is closely applied. Laterally it passes over and partly surrounds the round ligaments, forming the anterior leaflet of the broad liga-

ment. From the superior border of the broad ligament at either side and the fundus of the uterus in the center, it passes down over the posterior surface, enveloping the Fallopian tubes laterally, and covering the entire posterior surface of the uterus. It lines Douglas' pouch, sweeping over the uterosacral ligaments to either side, and thence passing to the lateral walls of the true pelvis. It surrounds the rectum for about two-thirds of its circumference, being continuous with the lower folds of the mesosigmoid. These reflexions of the peritoneum, which may be likened in their forma-

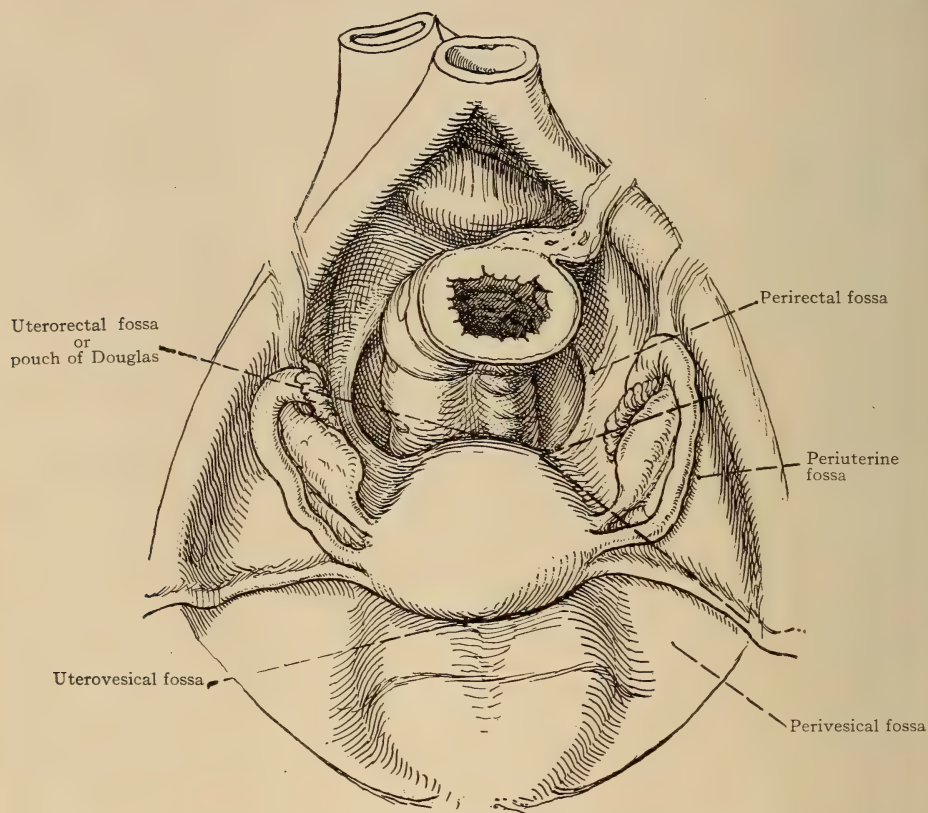


FIG. 58.—View of pelvis from above, showing relations of contained organs and peritoneal fossæ.

tion to a thin membrane blown into the pelvis and adjusting itself as a cover or support of its viscera, form certain fossæ; for example, between the bladder and the uterus, the uterovesical fossa; to either side of the rectum, the perirectal fossæ, and posterior to the uterus, the uterorectal fossæ or the pouch of Douglas. All these fossæ are occupied normally by coils of the small intestine and the omentum (Fig. 58).

The Uterine Ligaments.—The pelvic peritoneum is largely concerned with the formation of most of the so-called ligaments of the uterus. It enters into the formation of the *broad*, the *uterosacral*, and the *uterovesical* ligaments. These are principally made up of folds or of reduplications of the

peritoneum inclosing fatty areolar tissue and the lymphatic and vascular vessels supplying the uterus. Thus, the broad ligaments are made up of cellular tissue, a few smooth muscle-fibers, the ovarian and uterine vessels, with an anterior and a posterior peritoneal covering running from each side of the uterus to the corresponding pelvic wall (Fig. 59). The broad ligament is strengthened by its association with and peritoneal attachment to the round, to the utero-ovarian, and to the infundibulo pelvic ligaments, which contain particularly dense connective-tissue strands. The uterosacral ligaments are peritoneal folds running from the posterior surface of the

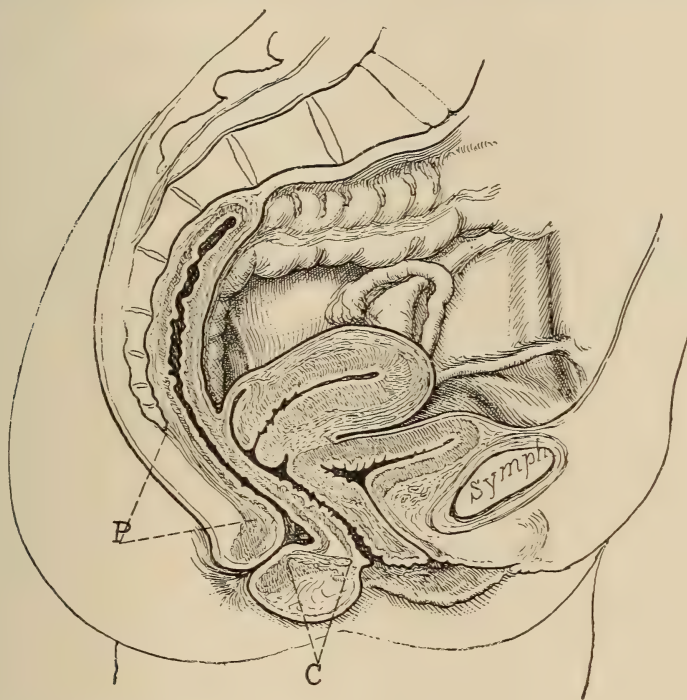


FIG. 59.—Lateral sagittal section of female pelvis, showing anterior and posterior segments of pelvic floor. (C) center of perineum; this with the area in front of it constitutes the anterior segment and is chiefly supported by the triangular ligament; (P) posterior segment of perineum chiefly supported by the levator ani muscle.

cervix just above its insertion into the posterior vaginal fornix, one on each side, around the lateral border of Douglas' pouch, and the rectum to the sacrum. They inclose connective-tissue prolongations from the broad ligament, smooth muscle-fibers, blood-vessels, and lymphatics. The utero-vesical ligaments are peritoneal folds running on each side of the vesico-uterine pouch from the lateral borders of the bladder to the uterus (Fig. 60). In structure, they resemble the uterosacral ligaments, but are less marked than the latter. Radiating from the neighborhood of the internal os, there are combined with the cellular tissue more or less well-defined fibromuscular and elastic bands. These serve as a part of the supporting apparatus of the pelvic viscera reinforcing the broad, uterosacral and utero-vesical ligaments.

At the base of the broad ligaments they comprise what are known as the *cardinal* ligaments—posteriorly, they form the supporting tissue of the uterosacral ligaments, and anteriorly they give strength to the uterovesical ligaments. The *round* ligament, the only true ligament of the uterus, is made up of fibrous and muscular tissue. It is from 12 to 14 cm. long. It springs from the anterior surface of the uterus at a point in front of and below the tube, and runs within the upper part of the broad ligament to the pelvic wall. From this point it continues its extraperitoneal course forward and upward, crossing the external iliac vessels, curving around the deep epigastric artery to the internal ab-

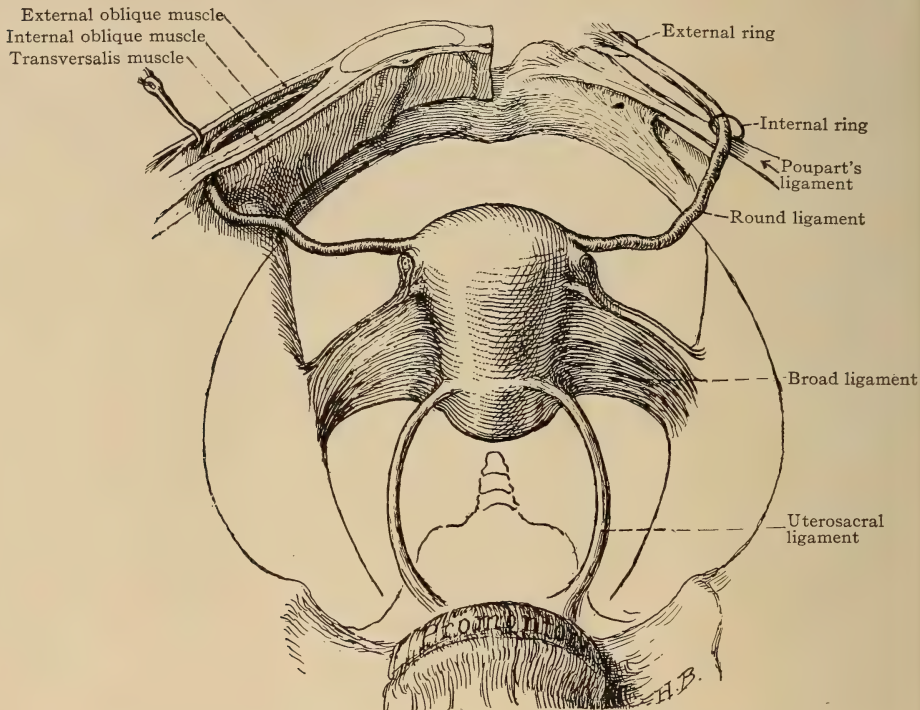


FIG. 60.—The supporting ligaments of the uterus and their relation to other pelvic structures.

dominal ring. It runs through the entire inguinal canal, and is inserted into the subcutaneous tissue of the labia majora and the pubic spine. The proximal two-thirds contains muscular tissue derived from the uterine wall, but the distal third consists entirely of fibrous tissue. In the fœtus a small peritoneal diverticulum usually accompanies the round ligament. This generally disappears, but may persist as a distinct serous pouch, known as the canal of Nuck.

The Pelvic Cellular and Connective Tissue.—At the sides and on the floor of the pelvis, between the pelvic peritoneum and the fascia over which it lies, there is a layer of loose fibroareolar tissue. This is known as the pelvic cellular tissue. In certain areas where, from reduplication of the peritoneum, a considerable interval occurs between it and the pelvic wall or

floor, this tissue is more abundant and forms a more or less distinct structure (Fig. 61). These especially well-developed parts of the pelvic cellular tissue are designated with names that describe their position. Thus the cellular tissue lying between the peritoneal covering of the broad ligament and extending to the pelvic wall and to the pelvic floor is termed the *parametrium*. The cellular tissue between the folds of peritoneum which form the uterosacral ligaments and the pelvic floor and sacrum, is known as the *paraproctium*. The cellular tissue surrounding the upper portion of the vagina and extending from the bases of the parametrium to the attachment between the vagina and the bladder, rectum, and levator ani fascia is designated the *paracolpium*. The cellular tissue between the folds of the uterovesical ligaments and the cervix and the superior surface of the bladder is termed the *paracystium*. Radiating from the neighborhood of the internal os there is combined with the cellular tissue more or less well-defined fibro-muscular and elastic bands. These serve as a part of the supporting apparatus of the pelvic viscera reinforcing the broad, uterosacral and uterovesical ligaments. At the base of the broad ligaments they comprise what are known as the cardinal ligaments—posteriorly they form the supporting tissue of the uterosacral ligaments, and anteriorly they give strength to the uterovesical ligaments. The most important vascular channels that supply the pelvic viscera pass through and are supported and sheathed by extensions and prolongations of this cellular and connective tissue (Fig. 62). The lymphatic channels from the uterus, especially those from the cervix and from the upper part of the vagina and the base of the bladder, course through this tissue on their way to the pelvic lymph-glands. From its position and from the lymphatics and the venous channels carried by it, this tissue is exposed to traumatism and to infection. Cellulitis may occur as the result of either condition, but is more commonly due to infection.

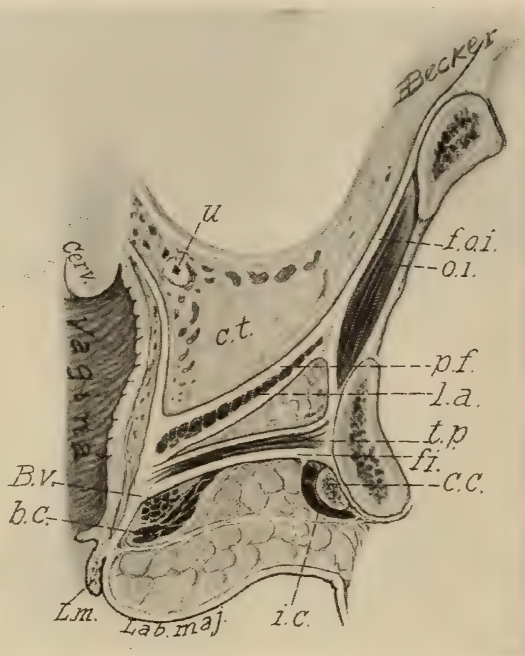


FIG. 61.—Frontal section of pelvis through urogenital triangle, showing muscles, fascia and cellular connective tissue. *c.t.*, connective tissue; *b.v.*, vestibular bulb; *b.c.*, bulbo-cavernosus muscle; *l.m.*, labium minus; *f.o.i.*, fascia of the obturator internus; *o.i.*, obturator internus; *p.f.*, pelvic fascia; *l.a.*, levator ani muscle; *t.p.*, transversus perinei muscle (semi-schematic); *fi.*, superficial fascia of urogenital triangle; *c.c.*, crus clitoridis; *i.c.*, ischio-cavernosus muscle; *u.*, ureter.

THE PELVIC FLOOR

The pelvic floor is formed by three muscles—the levator ani, coccygeus, and pyriformis—and their corresponding fascia (Figs. 63, 64 and 65). The most important of these muscles is the *levator ani*. This muscle arises from the posterior surface of the body of the os pubis in front, from the spine of the ischium behind, and between these two points, from the white line that marks the division of the pelvic fascia into the obturator and the rectovesical fascia. Its fibers converge downward and toward the median line, to

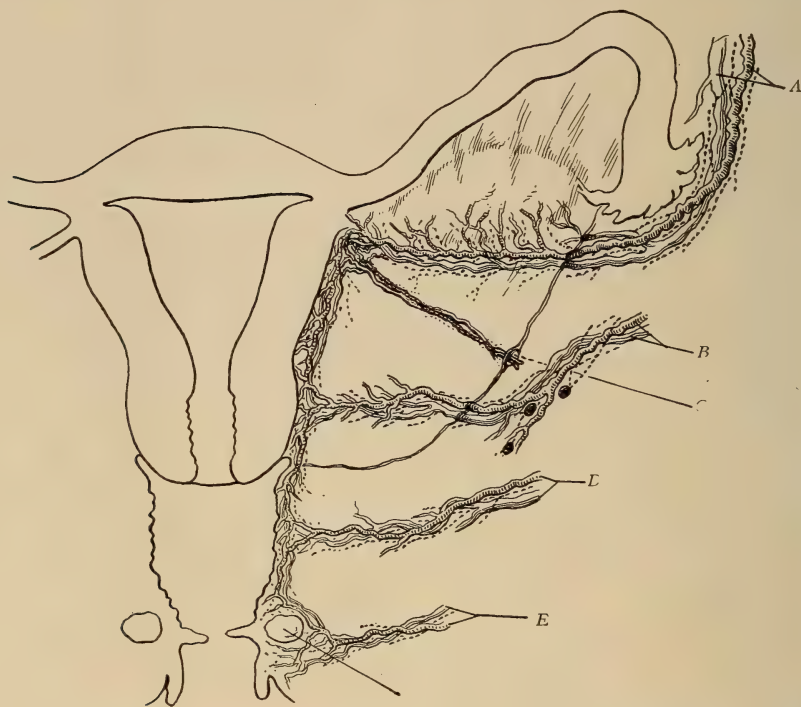


FIG. 62.—Semi-diagrammatic picture showing same general course of arteries, veins and lymphatics: (A) ovarian artery and vein, with lymphatics draining ovary and fundus which empty into lateral lumbar nodes; (B) uterine artery and vein with accompanying lymphatics which drain the lower uterine body, cervix and upper part of the vagina and empty into the median iliac nodes; (C) artery and vein of round ligament with accompanying lymphatics, which drain the fundus and empty into inguinal nodes; (D) vaginal artery and vein with accompanying lymphatics which drain vagina and empty into hypogastric nodes near origin of uterine artery; (E) branches of internal pudic artery and vein which supply the vaginal orifice, with accompanying lymphatics which drain the vaginal orifice and empty into the inguinal nodes.

be inserted into the coccyx, in the form of a tendinous raphé extending between the coccyx, the anus, and the lower part of the rectum.

The *coccygeus* muscle lies immediately posterior to the levator ani, and is comparatively small in size. It arises from the spine of the ischium, and is inserted into the sides of the sacrum and the coccyx.

The *pyriformis* muscle lies posterior to the coccygeus. It arises from the anterior surface of the sacrum, passes through the corresponding great sciatic foramen, and is inserted into the summit of the great trochanter.

The pelvic diaphragm or floor is attached directly to the lower part of



FIG. 63.—Fascia of pelvic floor.

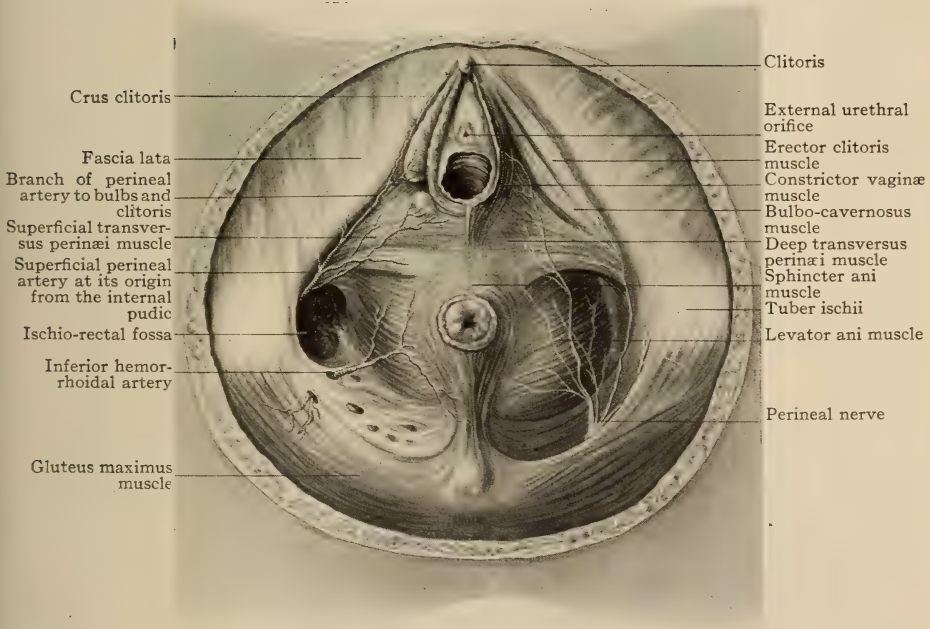


FIG. 64.—External muscles, fascia and structures of the perineum.

the rectum, its anterior fibers being in close relation to the vaginal sulci. The attachment to the lower rectum is by actual blending of the levator fibers with those of the intestine. It is connected with the vagina chiefly by fascial attachments, particularly by those relating to the superior layer of the triangular ligament (Fig. 66), and by virtue of certain accessory muscles—the transversus perinæi and the constrictor vaginae—supporting the lower vagina and the external genitalia.

The *transversus perinæi* muscles are made up of superficial and deep divisions. They arise on either side from the inferior ramus and tuberosity of

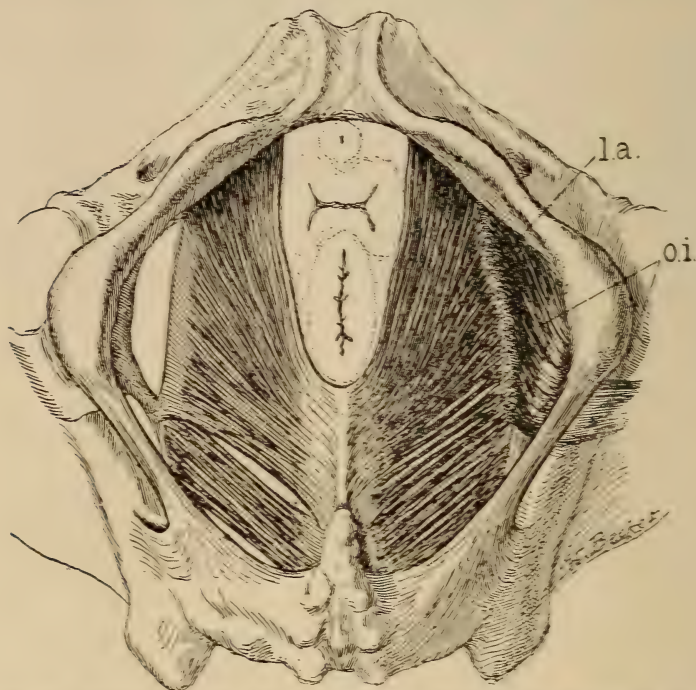


FIG. 65.—Muscles of pelvic floor from below, deep layer: (l.a.) levator ani and coccygeus muscles; (o.i.) obturator internus muscle. White line, arcus tendineus, between the two muscles.

the ischium, and pass to the median line, where they unite with each other and with the central tendinous point of the perineal body. The *bulbocavernosus*, or *constrictor vaginae* muscle, arises from the central tendon of the perineum; it encircles the vaginal orifice, investing the vestibular bulbs, and is lost in the fascia about the clitoris. The *external* and *internal sphincter* muscles of the anus (*sphincter ani*) are intimately related to the levator ani and the central tendinous point of the perineum. The external sphincter muscle arises from the tip of the coccyx and the tendinous raphé, extending between the coccyx and the anus. The fibers encircle the anus—the superficial ones being in close relation with the skin—and are inserted into the central tendon of the perineum and the superficial fascia. Some of the fibers decussate with the sphincter vaginae. The *internal sphincter ani* is

composed of involuntary muscle bundles, and is a thickening of the circular layer of the lower end of the rectum. It encircles the beginning of the anal canal. It is about 4 mm. thick and extends for a distance of from 2.5 to 3 cm.

THE FASCIA OF THE PELVIC FLOOR

The arrangement of the fascia of the pelvic floor is of considerable importance, because of the part it plays in the reënforcement and support of the muscles that form the pelvic diaphragm. The superficial fascia of the perineum is continuous anteriorly with that of the lower abdominal wall, and, like the latter, is composed of two layers. The superficial layer is in reality merely the panniculus adiposus of the skin. The deeper layer, known

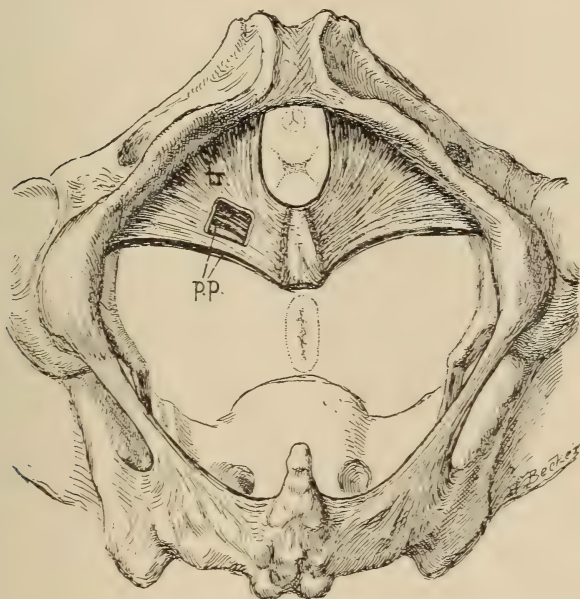


FIG. 66.—The triangular ligament in the female: (*tr.*) triangular ligament; (*pp.*) window cut out, showing the deep transversus perinæi muscle.

as Colles' fascia, is membranous in character and devoid of fat. It is continuous in front with the deep layer of the superficial fascia of the abdominal wall; laterally, it is attached to the sides of the pubic rami and the ischia, and posteriorly it blends with the posterior border of the triangular ligament along the lower margin of the superficial transversus perinæi muscles. Behind this line it unites with the superficial layer in a single sheet that becomes continuous with the superficial fascia of the gluteal region. The deep fascia of the perineum forms what is known as the triangular ligament. This is composed of two layers—a superior and an inferior. Each layer is attached in front to the corresponding rim of the pubes, and laterally to the corresponding edge of the ramus of the pubis and ischium. Behind, on an imaginary line drawn transversely between the tuber ischii, the two layers unite with each other and with the deep layer of the superficial fascia. The

triangular ligament is perforated by the vagina and the urethra. Its superior layer fuses above with the vesical reflection of the rectovesical fascia (pubo-vesico-cervical ligaments), below with the levator fascia, whereas at the sides both layers are continuous with the obturator fascia (Fig. 67).

THE BLOOD-VESSELS OF THE GENERATIVE ORGANS

The pelvic organs and the external genitalia receive their blood supply chiefly from the ovarian, the uterine, the vesical, the hemorrhoidal, and the

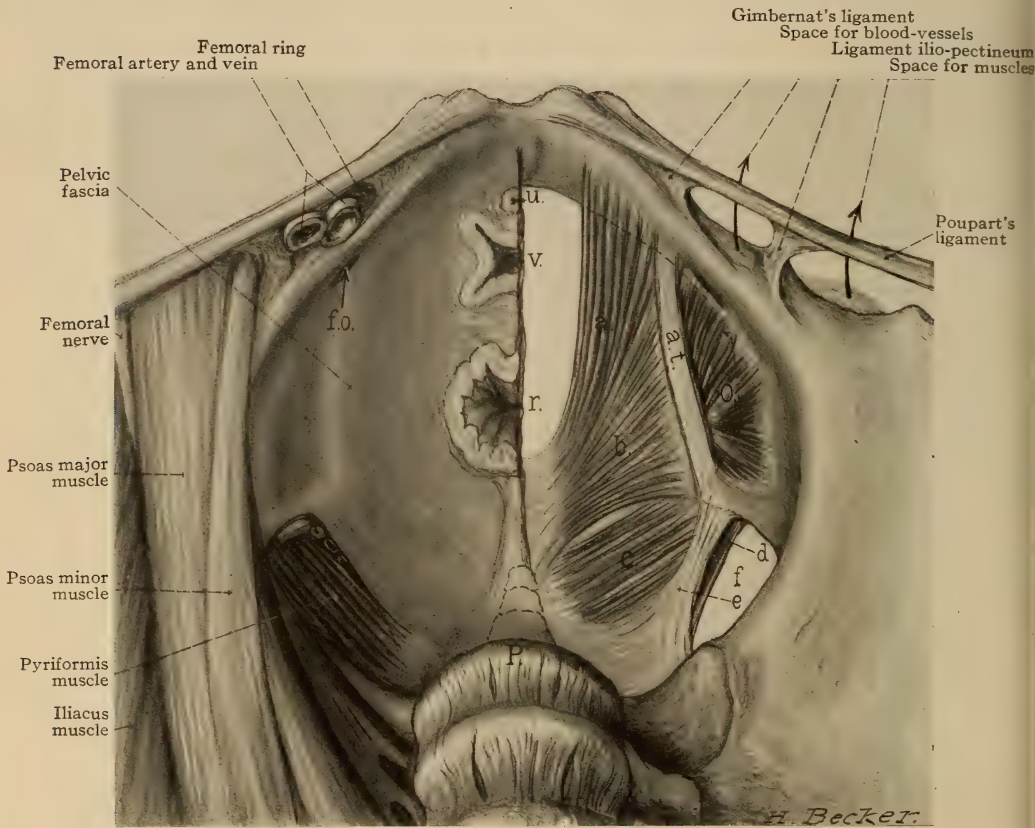


FIG. 67.—The pelvic diaphragm from above. The pelvic fascia on the right side has been removed: (v) vagina; (r) rectum; (P) promontory of sacrum; (a) pubococcygeus division of levator ani muscle; (b) ilio-coccygeus division of levator ani muscle; (c) ischio-coccygeus division of levator ani muscle; (d) ligament tubero-sacralis; (e) ligament spinoso sacralis; (f) ischiatic foramen, large and small; (o) obturator internus muscle; (a.f) arcus tendineus (white line); (f.o) obturator foramen.

internal pudic arteries. Most of these vessels are derived from the ramifications or the divisions of the internal iliac. The only arteries of importance that arise from sources other than the internal iliac are the ovarian, which spring from the abdominal aorta, and the superior hemorrhoidal artery, which is derived from the inferior mesenteric (Fig. 68).

Arteries.—The *ovarian arteries* are the analogue of the spermatic arteries in the male. They have their origin in the anterior surface of the aorta, a

little below the renal arteries. They run beneath the peritoneum to the pelvic brim, where they cross the common iliac vessels and enter the broad ligament at the pelvic attachment. They pass between the layers of the

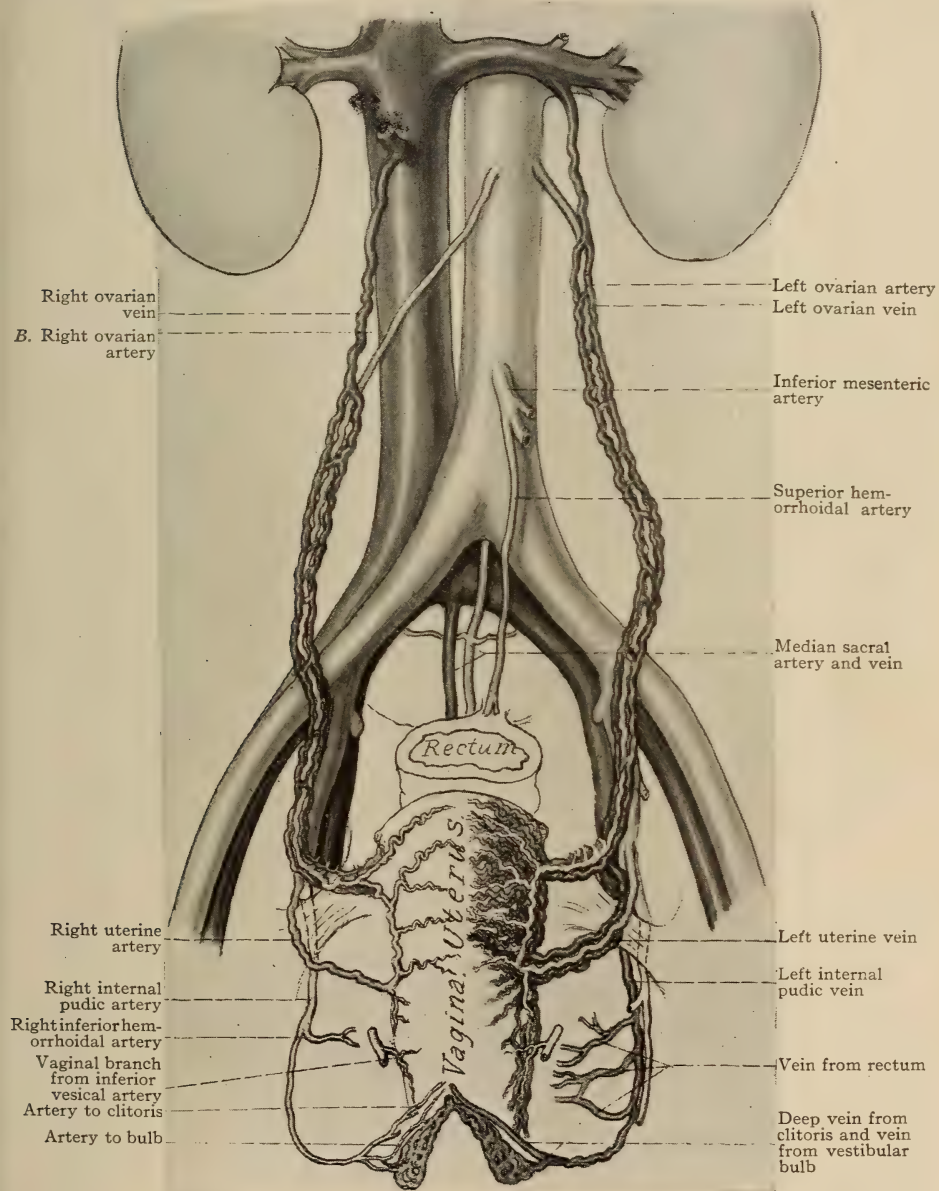


FIG. 68.—The blood supply of the pelvic viscera.

broad ligament to the cornua of the uterus, sending branches to the Fallopian tube, and anastomosing with the corresponding uterine artery beneath the isthmus of the tube.

The *internal iliac artery*, also called the hypogastric artery, is, as its name implies, the internal terminal division of the common iliac. Its most important branch is the uterine artery, but the superior and inferior vesical, the vaginal, the obturator, and the middle hemorrhoidal vessels are also derived from it. The main stem divides into the internal pudic and sciatic arteries.

The *uterine artery* runs through the base of the broad ligament toward the neck of the uterus. At a point about 2 cm. from the cervix it crosses the ureter (Fig. 69), and there turns upward and courses between the layers of the

broad ligament to the side of the uterus. At the cornua it anastomoses with the corresponding ovarian artery. From the anastomosis a branch is given off to the round ligament.

The *superior vesical artery* supplies the upper and middle portions of the bladder; whereas the *inferior vesical artery* supplies the base and neck of the bladder.

The *vaginal arteries* run to the sides of the vagina. Each vessel divides into numerous branches that anastomose with the corresponding branches of the opposite side. Along the median line of both the anterior and the posterior surface of the vagina a vessel, known as the azygous artery of the vagina, is more or less constantly present.

The *superior hemorrhoidal artery* is the terminal portion of the inferior mesenteric, and descends between the layers of the pelvic mesocolon. The *middle hemorrhoidal artery* arises from the internal iliac, the inferior vesical, or the internal

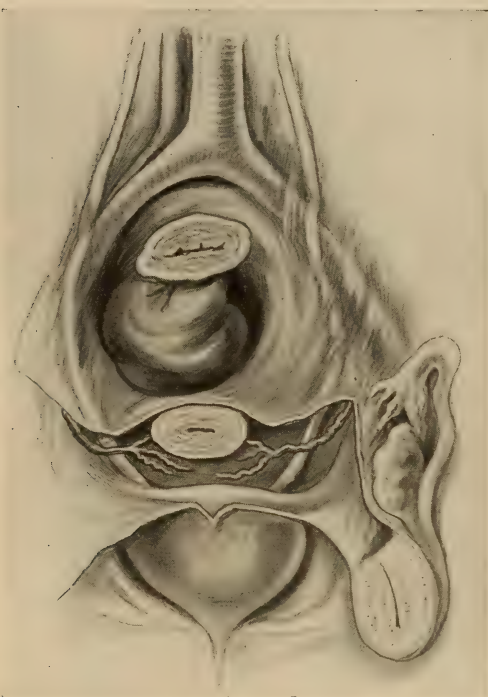


FIG. 69.—Anatomy of ureter, showing its course in the pelvis and its intimate relation to the uterine artery. The fundus of the uterus has been bisected and lifted away at its junction with the cervix. (After Tandler and Halban.)

nal pudic. The *inferior hemorrhoidal artery* arises from the internal pudic.

The *internal pudic artery* passes through the lesser sacrosclatic notch to the ischiorectal fossa. It gives off the inferior hemorrhoidal, the superficial perineal artery, the artery of the bulbs, and the urethral artery, and ends in the dorsal artery of the clitoris.

Veins.—The *ovarian veins* arise from the hilum of the ovary and anastomose with the veins of the uterine fundus, Fallopian tube, and round ligament, forming what is known as the *pampiniform plexus*. This plexus lies with the ovarian artery between the layers of the broad ligament; it merges into a single trunk which ascends along the course of the ovarian artery into the abdominal cavity. The right vein empties into the inferior vena cava; the left into the left renal vein.

The *uterine vein* takes its origin at a point opposite the external os. It is derived from the plexus uterovaginalis. At first it is double, both trunks following the course of the artery. Beyond the ureter the two become united, and the vessel empties into the internal iliac.

The *vesical veins* originate in the vesicovaginal plexus. They empty into the internal iliac.



FIG. 70.—Sagittal section of rectum, showing hemorrhoidal arteries, veins, and lymphatics of rectum and anus. Superior hemorrhoidal artery comes from the inferior mesenteric. Middle hemorrhoidal artery comes from internal iliac artery. Inferior hemorrhoidal artery comes from internal pudic artery. Superior hemorrhoidal vein empties into the portal system through the inferior mesenteric vein. Middle hemorrhoidal vein empties into the inferior caval system through the internal iliac vein; it forms by its connections a communication between portal and inferior caval systems. Inferior hemorrhoidal vein empties into the internal pudic vein. The lymphatics of the upper two-thirds of the rectum drain into the sacral glands on the front of the sacrum. The plexus around the anus and lower part of the rectum drains into the inguinal glands.

The *internal pudic vein* enters the pelvis through the lower part of the great sacrosciatic foramen, and empties into the internal iliac.

The *internal iliac or hypogastric vein* accompanies the internal iliac artery, lying to its inner and posterior aspect. At the level of the sacroiliac synchondrosis it unites with the external iliac to form the common iliac vein.

The *obturator vein* accompanies the obturator artery and, as a rule, empties into the internal iliac.

The *superior hemorrhoidal vein* originates in the hemorrhoidal plexus, and

unites with the sigmoid veins to form the inferior mesenteric. It communicates with the middle and inferior hemorrhoidal veins, thus placing the portal and inferior caval systems in communication.

The *middle hemorrhoidal vein* arises from the hemorrhoidal plexus and empties into the internal iliac or one of its tributaries.

The *hemorrhoidal plexus* encircles the rectum. It is composed of two venous networks—the internal hemorrhoidal plexus in the submucosa of the rectum, and the external hemorrhoidal plexus on the outer surface of the

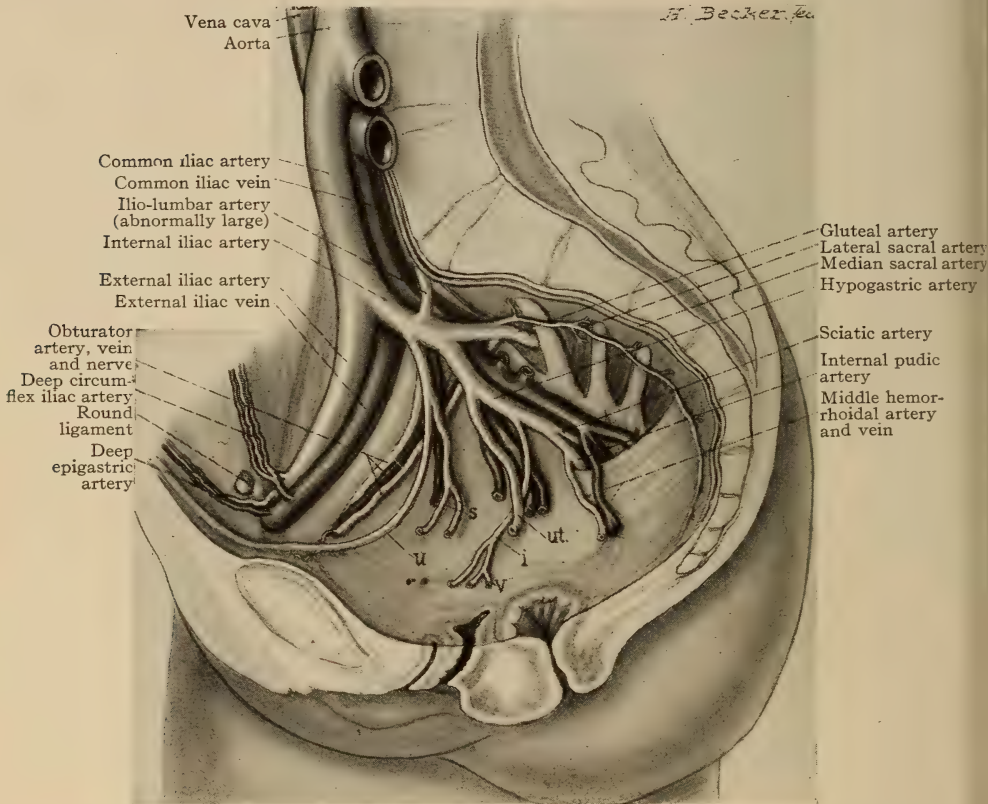


FIG. 71.—Blood-vessels of the pelvis: (s) branches of superior vesical artery; (v) vaginal branch from inferior vesical artery; (u) superior vesical artery merging with obliterated remains of hypogastric arteries; (i) inferior vesical artery; (ut) uterine artery.

rectum. The *inferior hemorrhoidal veins* pass from the region of the anus through the ischiorectal space and empty into the internal pudic vein (Figs. 70 and 71).

THE LYMPHATICS OF THE PELVIS

The *pelvic lymph-nodes* are arranged along the course of the principal vessels, and for convenience may be divided into three groups: The iliac, the hypogastric, and the sacral.

The *iliac nodes* lie along the course of the common and external iliac vessels, from Poupart's ligament to the bifurcation of the aorta. They receive affer-

ent lymphatic vessels from the epigastric and circumflex iliac nodes, from the lower part of the ureter, bladder, cervicovaginal junction, clitoris, etc. They distribute efferent vessels to the lower lateral lumbar nodes.

The *internal iliac* or *hypogastric nodes* are situated on the lateral walls of the pelvis, along the internal iliac vessel and its branches. They receive *afferent* vessels from all the pelvic organs supplied by the internal iliac artery or its branches. They send lymphatic vessels to the iliac nodes on the promontory of the sacrum.

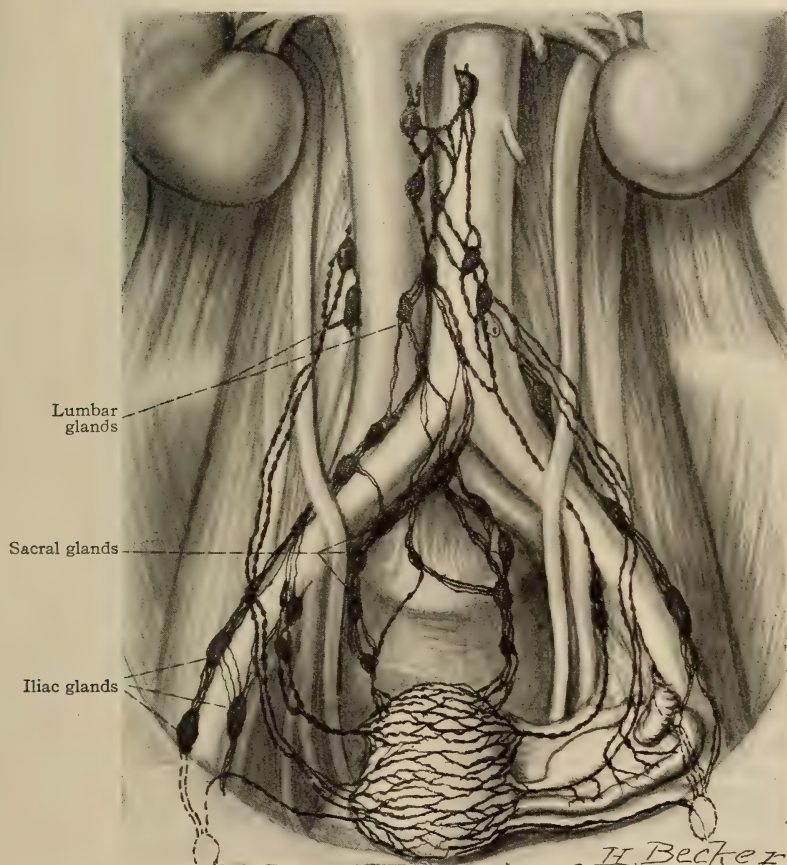


FIG. 72.—Lymph vessels and glands of pelvic and lumbar regions, showing course of uterine lymph vessels to iliac, sacral and lumbar glands, the course of lymph vessels from fundus and round ligaments to the inguinal glands, and the course of lymph vessels of the ovary to the lumbar glands. (After Poirier and Sabotta)

The *sacral nodes* lie on the ventral surface of the sacrum, along the middle sacral vessels and lateral sacral arteries. They receive afferent vessels from the cervix by way of the uterosacral ligaments from the neighboring muscles, and from the sacrum, and they send vessels to the iliac nodes on the promontory of the sacrum.

The *inguinal nodes* are really a single group, situated in the inguinal region over Scarpa's triangle, where they form a mass of considerable size. The

upper nodes are termed the inguinal, whereas the lower are called the sub-inguinal.

The *lymphatics* from the external genitalia pass to the inguinal or sub-inguinal nodes; those from the clitoris may reach the lower iliac nodes.

The lymphatics of the ovary and Fallopian tube follow the course of the ovarian blood-vessels and terminate in the lateral lumbar nodes.

For convenience of description, the lymphatics of the uterus may be divided into three groups:

(1) The *large fundal*, which follow the ovarian lymphatics and terminate in the lumbar nodes.

(2) The *small fundal*, which reach the inguinal nodes along the round ligament.

(3) The *lower corporeal and cervical*. These pass laterally along the uterine vessels to the iliac nodes, in the angle between the external and the internal iliac arteries. Posteriorly, branches run through the uterosacral ligaments to one uterosacral gland.

The *lymphatics of the vagina* are divided into three groups:

(1) The lymphatics from the upper part, which terminate in the median iliac nodes.

(2) The lymphatics from the middle part, terminating in the hypogastric nodes.

(3) The lymphatics from the lower part, which terminate in the inner inguinal nodes (Fig. 72).

THE ABDOMINAL WALL

The abdominal wall, or *parietes*, is made up of muscles and fasciæ which interlace and form a strong boundary for the abdominal cavity and false pelvis. In the median line are the two rectus muscles, running from the ensiform cartilage and lower ribs to the symphysis pubis. Beyond the rectus are the external and internal oblique and the transversalis muscles and aponeuroses. The aponeuroses of the lateral group connect the fascia of the rectus muscles to their outer side in what is known as the linea semilunaris, which runs from the tip of the ninth costal cartilage to the spine of the pubis. The fascia of the rectus surrounds that muscle, except at its lower third, where it passes directly in front of it. The point of fascial union in the median line is known as the linea alba. The abdominal muscles are attached above to the costal margins and the associated musculature; posteriorly, to the lumbar group, and below, to the pubes, iliac crests, and to the condensation of fasciæ of the oblique and transverse muscles known as Poupart's and Gimbernat's ligaments.

BIBLIOGRAPHY

- HUNNER, LYON: "Mensuration and Capacity of the Female Bladder." J. A. M. A., Dec. 16, 1899.
 PIERSOL, G. A.: Human Anatomy. Lippincott, Phila., 1907.
 PORRIER, CUNEO AND DELAMERE: The Lymphatics. Keener & Co., Chicago, Ill., 1904.
 SAMPSON: "The Variations in the Blood Supply of the Ovary and Their Possible Operative Importance." Trans. Amer. Gyn. Soc., 1916, vol. xli, p. 429.
 SAVAGE: The Surgery, Surgical Pathology and Surgical Anatomy of the Female Pelvic Organs. Wm. Wood & Co., New York, 1880.
 TUTTLE, J. P.: Diseases of the Anus, Rectum and Pelvic Colon. Appleton, N. Y., 1907.

CHAPTER IV

PHYSIOLOGY

Introduction.—The generative organs remain functionless until puberty is reached. During the reproductive period, which extends from puberty to the menopause, these organs are highly specialized structures whose functions bear most important relations to the general physiologic activity of the individual, and, indeed, to a certain extent dominate it. Following the menopause the generative organs again become functionless and undergo atrophy. It is a peculiarity of the generative organs that they remain dormant up to a certain time, after which they become active for a period of years, comprising what is known as the prime of life, and then become extinct.

Although reproduction may occur at puberty, children born during this early period are apt to be frail and weakly. A female is not sexually matured—that is, entirely fitted for wifehood and motherhood—until she is out of her teens, or even several years later. The stage of sexual maturity is known as nubility.

The Age of Puberty.—Puberty [Latin: *puber'tas*, maturity], the age at which an individual begins to functionate sexually, occurs in women between the twelfth and fifteenth year. In hot climates puberty is said to occur early, whereas in cold climates it occurs late. Englemann, after an analysis of 60,000 cases, declared that the difference in onset is less marked than is commonly supposed. The negro maiden of Somaliland sometimes matures at sixteen, as late as her Lapland and Samoyed sisters. Eskimo women, on the other hand, may become mothers at the age of twelve—just as early as Hindu women. Englemann attributes this to the oily diet of the arctics and the sluggish habits of the equatorial natives. It is a fact, nevertheless, that warm climates do predispose to early puberty, and cold climates to late puberty; the variation is more apparent relatively in distant parts of the same zone than in extreme zones, such as the tropical and the arctic. The onset of puberty is influenced also by race, social position, and mode of life.

The effect of race and climate on puberty is illustrated by the observation of Das, that Hindu and Mohammedan girls in India menstruate two or three years earlier than English girls born in India, and that the latter menstruate a year or so earlier than English girls born in England.

Kisch asserts that girls in the higher planes of society menstruate earlier than those in the lower; that city girls menstruate earlier than country girls; that those of rugged constitution menstruate earlier than those who are frail and weakly; brunettes menstruate earlier than blondes. The Hebrew (Semitic) and the oriental races menstruate early, the Aryans and the Slavs later.

Manifestations of Puberty.—The onset of puberty is attended with many changes, both psychic and physical. The intellect, emotions, and will of the girl gradually become those of the woman. The range of voice is increased

by a lengthening of the larynx, and the face and figure acquire the contour characteristic of the sex. The internal and the external sexual organs, with their accessory structures, increase in size and in vascularity; the pelvis assumes a characteristic shape. The pubic and axillary hairs now make their appearance. The body or fundus of the uterus develops rapidly, until it constitutes two-thirds of the entire organ, whereas the cervix, which is larger than the fundus during infantile life, forms but about one-third of the entire structure. The infantile twisting of the tubes is gradually eliminated, and the tubal canal is somewhat reduced in length. Quite marked changes take place in the ovary. Clark has shown that during childhood the primordial follicles develop up to a certain point in about the same manner that they do after the age of puberty. The follicles affected are those lying in the most vascularized part of the young ovary, *i.e.*, near the center; they never reach the surface and do not rupture. After attaining a fair size the granulosa cells degenerate, and the follicle is finally obliterated by a process that resembles the evolution in older ovaries of the corpus luteum and the corpus albicans. Nearly every vestige of the latter is absorbed, but the destruction of the follicles at the center of the ovary gradually causes an increase of connective tissue at this point, and at the age of puberty the undeveloped primordial follicles are in the cortex of the organ, and as the Graafian follicles reach their full growth, they distend the tunica albuginea and rupture.

FUNCTIONS OF THE SEXUAL ORGANS

The External Genitalia.—The labia protect the orifice of the vagina and the urethra; the clitoris and the vestibular bulbs are erectile structures concerned with copulation.

The Vagina.—The vagina is penetrated by the male organ during copulation. The vaginal fornices are the receptacle for the spermatic fluid, whence the spermatozoa gain access to the uterus. The vagina is also the passageway through which the fœtus is born. Owing to its shape, which resembles the letter H, and to the reserve mucosa in its sulci, the vagina is capable of undergoing marked distention without serious injury during labor.

The Uterus.—The uterus secretes the menstrual fluid. During pregnancy the uterus nourishes and protects the ovum. The activity of the uterine muscle is one of the most important factors in the process of labor.

The Fallopian Tubes.—The tubes transmit the ova to the interior of the uterus. They are a lurking place for the spermatic particles, and conception is believed usually to occur in their outer third. Under exceptional circumstances they may give off a bloody discharge during menstruation, but, as a rule, they take no part in the process.

The Ovaries.—The ovaries are the dominating reproductive organs, and are responsible for the physiologic activity of the remaining organs. If the ovaries are healthy and active, the other organs are likely to be the same; if the ovaries are poorly developed and functionally deficient, almost any abnormality in development may be found in the other organs. This may be somewhat in the nature of cause and effect, or the condition of the entire genital system may be primarily hypoplastic.

It has long been the belief that the ovaries possessed an internal secre-

tion, and since the experimental work of Fraenkel the corpus luteum is recognized as the most actively secreting portion. The follicles of the ovary and the interstitial gland also possess a secretion. This combined internal secretion of the ovary has a general effect upon the economy, which contributes to the well-being of the individual.¹ The truth of this statement is apparent from the numerous vasomotor and nervous disturbances that at times follow abrupt withdrawal of the secretion, as after bilateral oöphorectomy (artificial menopause). The ovarian secretion brings about the phenomena of menstruation (see Ovulation), and on its withdrawal menstruation ceases.

The ovarian secretion is also responsible for the formation of the decidua and the early enlargement of the uterus during pregnancy; in other words, it aids in the nourishment and protection of the early ovum. Fraenkel has demonstrated the truth of these statements in experiments on rabbits. Destruction of the corpora lutea in both ovaries was followed by cessation of menstruation for a period of from one to two months; destruction of the corpora lutea in the earliest stage of pregnancy resulted in degeneration of the embryo. The internal secretion of the ovary is the one stimulant² that is essential to the physiologic activity of the reproductive organs. Some of the other ductless glands also have an influence upon menstruation, and their secretion probably serves as an adjuvant to the ovarian products. The influence which these glands have upon the reproductive system may be learned from a study of the following structures:

The Pituitary Body.—A definite relationship has been established between the pituitary body and the generative organs. It may be stated in a general way that the hypophyseal secretion is antagonistically complementary to that of the ovaries. The most frequently encountered manifestation of a dysfunction of the pituitary body is evidenced in that symptom-complex resulting from a hypofunction after puberty, consisting of a marked adiposity, associated with genital atrophy and a lack of or diminution in the functioning of the genital organs. The early increase in genital activity in acromegaly, due to hyperfunction, is soon followed by a functional atrophy of the genital organs. That the gland is enlarged in pregnancy has been

¹ Frank notes the secreting parts of the ovaries as the follicles, the corpus luteum, and the interstitial gland. The ovarian secretion is not essential to the continuance of life. Hyperfunction of the ovaries in adults produces menorrhagia; hyperfunction in children gives rise to premature sexual development. Hypofunction in adults causes amenorrhœa and obesity; in children it produces infantilism. Oöphorectomy in adults is followed by an artificial menopause; in children, by eunuchoid habits, genital atrophy, and a neuter type of development (no data bearing on the findings in humans are available). The reports on the therapeutic use of ovarian extracts show no uniformity of results.

² There are a few well-authenticated reports of a continuance of menstruation after complete removal of both ovaries. This has led some observers to believe that the compensatory activity of some of the other glands of internal secretion normally associated with the ovary in the production of menstruation may be sufficient to continue "the habit of menstruation," especially if, by reason of uterine adhesions, the blood supply to the uterus is above normal. While this possibility cannot be denied absolutely, the continuance of the menses in these cases is more probably due to the presence of supernumerary ovaries that have escaped observation.

There are two varieties of supernumerary ovaries: First, contiguous supernumerary ovaries, which are situated on or close to the normal ovary; secondly, aberrant ovaries, which lie at a point in the line of descent of the fetal ovary (these are the size of a millet seed, a pea, or rarely of a cherry).

shown by necropsy findings in women who have died during pregnancy, as well as by the facial changes, simulating those of acromegaly, that are prone to occur during pregnancy. The increase in the anterior lobe occasioned by pregnancy may persist for several years. Removal of the pituitary gland in pregnant dogs has been followed by abortion.

Extracts of the posterior lobe have been used as oxytocics during parturition and for the control of uterine hemorrhages in the non-pregnant state. Extracts of the anterior lobe have been used with some success in functional amenorrhœa associated with marked adiposity.

The Thyroid Gland.—The most prominent symptom of the inter-relationship of the genital organs and the thyroid gland consists in the marked enlargement of the gland that occurs during pregnancy. This increase in the size of the gland, with its correspondingly greater amount of secretion, is a physiologic hypertrophy, and is believed to assist in the regulation of the metabolism of the maternal organism during this period.

A similar increase in the size of the gland, though of less marked degree, is often noted during menstruation. Disturbances of the thyroid gland may be responsible for amenorrhœa, menorrhagia, and metrorrhagia. That its physiologic relationship to the genital organs is as yet imperfectly understood is evidenced by the fact that these conditions, while of distinctly opposite nature, are often benefited clinically by thyroid therapy. Patients suffering from Graves' disease are usually sterile, and pregnancy exercises a decidedly unfavorable influence on the prognosis of Graves' disease. The undeveloped genitalia symptomatic of hypothyroidism, myxœdema, and cretinism are often stimulated to growth by the administration of the necessary thyroid tissue. Many cases of myoma of the uterus are associated with hypertrophic thyroid glands. The administration of thyroid gland extract, alone or in combination with other glandular substances, is indicated only in a few instances, and owing to the fact that an excessive secretion of this gland is easily produced, and may and often does cause serious nervous and functional disturbances, the original dose should be small—one-half grain three times a day, the dose gradually increased as may be found necessary.

The Parathyroid Glands.—From the fact demonstrated experimentally in animals, that tetany follows removal of the parathyroid glands, the attempt has been made to prove that a similar condition in the human may be due to an insufficiency of parathyroid tissue. The administration of parathyroid glandular tissue in the tetany of pregnancy, eclampsia, and osteomalacia has not, however, been sufficiently successful to call for more than a brief mention.

The Suprarenal Glands.—The inter-relationship of the suprarenal glands and the ovaries and other genital organs has been manifested in several conditions. The suprarenal glands are hypertrophied during menstruation and pregnancy in women as well as in animals. Precocious and abnormal sexual development is commonly found associated with a marked increase in the size of the suprarenal glands; hypernephromata may be accompanied by an abnormal sexual development, even in children. Hyposuprarenalism, known clinically as Addison's disease, is often associated with diminished genital activity and even organic atrophy.

The Pineal Gland.—The relation of this gland to the physiologic activity of the female pelvic organs has been manifested in the pronounced overdevelopment of the sexual organs before puberty in cases associated with tumor formation of the pineal gland.

The Placenta.—The placenta contains a chemical substance that is known to be thermostabile (Frank) (very resistant in strong alkalis and acids and completely soluble in 95 per cent. alcohol), and that experimentally induces rapidly hyperplasia of the uterus and the breast. In its physical, chemical, and biologic properties it appears identical to a similar substance obtained from the corpus luteum. In view of this identity it is considered probable that the placenta acts merely as a storage reservoir for corpus luteum secretion during the latter half of pregnancy.

The Mammary Glands.—That a close relationship exists between the genital organs and the breast is obvious. This is proved by the rapid development of the breasts at puberty, the swelling of the breasts at the menstrual periods, the hypertrophy of the breasts and secretion of milk incident to pregnancy and lactation, and the atrophy that takes place at the menopause.

These changes seem to be brought about by some chemical agent that is present in the blood. The derivation of this substance has been ascribed to the ovary and the placenta, but no entirely satisfactory solution of the problem has as yet been offered.

MENSTRUATION

Menstruation [Latin: *menstruus*, monthly, from *mensis*, month] is a complex process of which the most obvious evidence is the menstrual flow. It recurs at periodic intervals of about four weeks from puberty to the menopause. The provocative impulse evidently lies in the ovaries, for if these organs are removed, menstruation ceases. The ovary has an internal secretion that gives rise to the menstrual molimina. An ovarian impulse and a uterine response are essential to the menstrual flow. The internal secretion of the ovary produces the impulse, and the endometrium excretes the menstrual fluid. The menstrual flow is but a part of menstruation. Besides its effect on the endometrium, the ovarian secretion, either alone or more probably in combination with the other ductless gland secretions, generally stimulates metabolism as the menstrual epoch draws near. This exaggeration of metabolic activity is recognized by an increase in the function of the muscular, respiratory, circulatory, and nervous systems before the flow appears. After the flow sets in, there is a relative decrease. There are various subjective and objective manifestations of the metabolic disturbance; thus the patient may complain of lassitude, headache, and pain in the lower part of the abdomen, in the back, and in the thighs. The breasts may become engorged and painful. There is often some perversion of taste and of the other senses. Disturbances of the digestive tract are not uncommon. Various neuroses may become manifest, and spots of pigmentation and skin eruptions may appear upon the face, thighs, abdomen, and breasts. The widest variation of these symptoms may obtain, depending upon the temperament and the physique of the individual.

The Menstrual Fluid.—The menstrual fluid consists of blood mixed with the glandular secretions and the desquamated surface epithelium of the endometrium. As long as the normal proportion between its constituents is preserved, menstrual blood shows no tendency to clot. Bell ascribes this fact to a lack of fibrin ferment in the menstrual fluid, and Dienst believes that the endometrial cells excrete a substance that inhibits coagulation. The hemal constituent is derived from the subepithelial capillary plexus of the endometrium, largely by diapedesis, partly by minute ruptures in the capillary walls. The blood collects in the superficial part of the endometrium, beneath the surface epithelium, through which it finally passes, detaching the epithelium here and there and carrying away small portions (Fig. 73). The amount of menstrual blood lost at a single period is said to be from four to six ounces. The flow continues, on the average, for from three to five days, but it may vary between one and eight days.

The Menstrual Habit.—So far as regularity, duration, and amount of the menstrual flow are concerned, a woman may exhibit certain peculiarities that are compatible with perfect health. Thus the menstrual interval may vary between three weeks and a full calendar month, the length of the period may be longer or shorter, and the amount of fluid lost may be more or less than the average. The individual's custom in this respect is known as her *menstrual habit*. This habit must always be taken into account when estimating the significance of the menstrual symptoms. Menstruation does not always appear as a well-established function from the start. After its first appearance, several months or even a year or more may elapse before menstruation becomes periodic and regular.

Ovulation.—Ovulation is believed by most observers to be coincident with menstruation. Thus Clark, in his brilliant work on the circulation of the ovary, gave it as his opinion that the increase in the amount of blood sent to the pelvic organs during menstruation caused a marked augmentation of the intracapsular pressure of the ovary and directly resulted in the bursting of the Graaffian follicle. The more recently expressed views of Fraenkel, Peters, Schroder, Meyer-Ruge, and others are not in accord with those generally accepted in the past. By comparing the menstrual history, the histologic appearance of the endometrium (Figs. 73-77), and the results of gross and microscopic examination of ovaries removed at operation, these investigators conclude that ovulation commonly takes place from fourteen to sixteen days after the onset of menstruation. The corpus luteum which follows reaches the height of development from the eighteenth to the twenty-fifth day, and forms the stimulus for the next menstrual epoch (Fig. 78). Should conception occur, then the action of the corpus luteum is diverted to the formation of the decidua and the implantation of the ovum.

Whether or not we accept the newer view, it has always been admitted that menstruation and ovulation do not necessarily occur at the same time. Thus, Leopold and Mironoff, who were adherents of the older theory, on examination of forty-two menstruating women at operation or at autopsy, found that ovulation had taken place in only thirty. Arnold made observations of a similar nature, and in but thirty-nine out of fifty-four operative or post-mortem cases did he find a fresh corpus luteum at the close of the

menstrual period. Ovulation may occur in women who have had no menstrual flow. Thus ovulation continues after hysterectomy with retention of the ovaries, when there is not sufficient uterine mucosa to respond to the

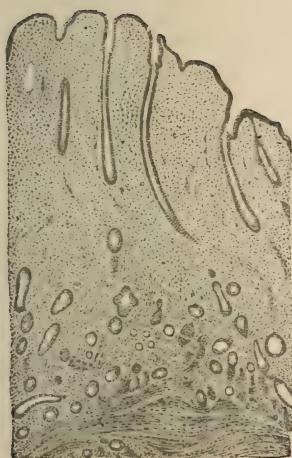


FIG. 73



FIG. 74

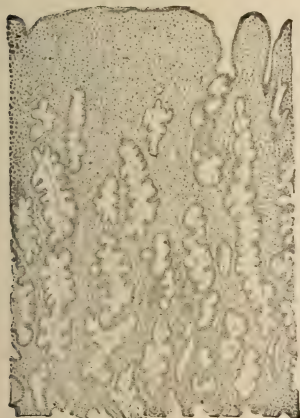


FIG. 75

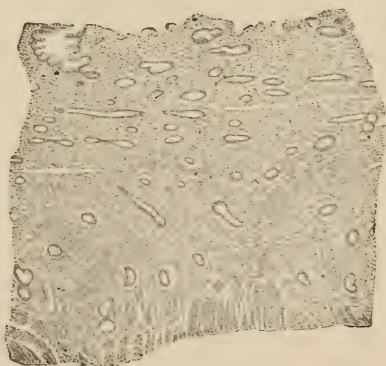


FIG. 76

FIGS. 73, 74, 75, 76.—The mucous membrane of the uterus in the various phases of menstruation. Fig. 73.—Menstrual mucous membrane one day after menstruation. Fig. 74.—Endometrium during the interval. Fig. 75.—Premenstrual condition. Fig. 76.—Third day of menstruation, showing exfoliation of the superficial layer. (After Hitschmann and Adler, from Keibel and Mall.)

ovarian impulse. A curious instance of ovulation in the absence of menstruation is reported by Stengel. In this case pregnancy and childbirth occurred in a woman aged twenty-one who had never menstruated. The woman was in robust health, and had been married three years when conception took

place. As a further example it may be noted that pregnancy frequently occurs during lactation when the periods have been entirely absent. Gebhard cites a case of Krönig's in which, four days after labor, conception again occurred. It is evident, therefore, that while, as a rule, menstruation



FIG. 77.—The uterine mucous membrane in the first day of menstruation: (*H*) hematoma under the epithelium; (*Bl*) hemorrhage into the compacta; (*Co*) compacta; (*Sp*) spongiosa; (*Po*) gland of the post-menstrual type; (*Pr*) gland of the pre-menstrual type; (*M*) muscularis. Hitschmann and Adler, from Keibel and Mall.)

and ovulation bear a certain time relation to each other, ovulation may take place without menstruation. Menstruation may occur at a different time than ovulation, but it is, nevertheless, dependent upon the activity of the ovary, for unless follicle-bearing tissue is present in the ovary, menstruation will not take place. Clark has shown that menstruation begins at the time

the Graafian follicles have reached that stage in their development when they approach the surface of the ovary and rupture into the free peritoneal cavity. When but few follicles remain and the organ is little more than a mass of scar tissue, menstruation ceases.

The menstrual flow is dependent immediately upon an intense congestion of the uterine mucosa and a menstrual diapedesis (Fig. 79). The flow is modified by abnormalities both in the uterus and in the ovaries. If the uterus is imperfectly developed, the diapedesis will be affected correspondingly. If the ovarian tissue is not normal, the physiologic impulses of menstruation will be faulty and the process be variously modified. The ill-developed, atrophic, or infantile uterus excretes less menstrual blood than the larger normal organ, since its endometrial surface is smaller and its blood supply deficient. The enlarged uterus of chronic metritis or of subinvolution gives off more menstrual blood than is normal for the area of endometrium and the blood supply is increased. Deficient ovarian secretion leads to subnormal menstrual congestion and diminished menstrual flow. Congenital deficiency of the ovarian activity is commonly associated with ill-developed uteri. Acquired deficiency the result of

resection of the ovaries or of loss of one ovary may be followed by a diminution in the menstrual flow, since the menstrual impulse has been reduced. Abnormal production of the ovarian secretion (as in the presence of Graafian follicle cysts, corpus luteum cysts, cystic degeneration) may lead to irregularity, temporary cessation, diminution, or increase of the menstrual flow. A perverted ovarian function has at times been attributed to nervous influences. According to Clark's original theory, the congestion of the ovary at the menstrual period, with the consequent increase of tension within the ovary, leads to bursting of the ripe follicle projecting from the surface. If the more recently expressed views as to the time of ovulation are correct, the follicular rupture may be attributed to an increasing accumulation of follicular fluid.

Abnormal production of the ovarian secretion (as in the presence of Graafian follicle cysts, corpus luteum cysts, cystic degeneration) may lead to irregularity, temporary cessation, diminution, or increase of the menstrual flow. A perverted ovarian function has at times been attributed to nervous influences. According to Clark's original theory, the congestion of the ovary at the menstrual period, with the consequent increase of tension within the ovary, leads to bursting of the ripe follicle projecting from the surface. If the more recently expressed views as to the time of ovulation are correct, the follicular rupture may be attributed to an increasing accumulation of follicular fluid.

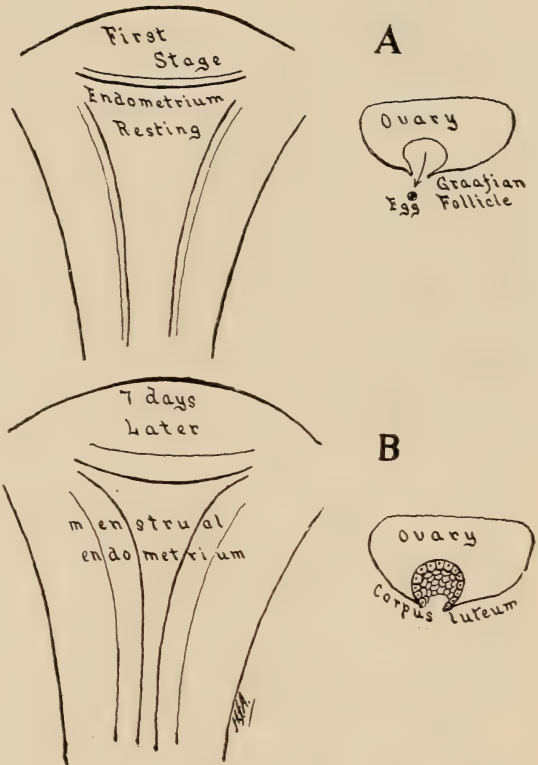


FIG. 78.—Schematic drawings to illustrate relation between ovulation and menstruation: (A) about 21 days after beginning of last period: ovulation taking place—mucosa resting; (B) beginning of new menstrual period: corpus luteum of menstruation formed, menstrual endometrium.

Anatomic Changes Incident to Ovulation and Menstruation.—According to Clark, the mature follicle about to rupture appears in the form of a bleb projecting from the stroma of the ovary above the level of the tunica fibrosa. At the point where this blister rises from the surface of the ovary many deeply injected vessels are seen springing from the depths of the ovarian stroma, and spreading out over the follicle as a fine net. These vessels, as a rule, become less numerous as the most prominent point is reached, where they may disappear entirely. It is at this latter point that the follicle ruptures, and the ovum with the follicular fluid escapes into the pelvis. Following rupture there is an extravasation of blood into the follicular cavity. Into this blood-clot newly-formed veins and arteries are projected from the connective tissue surrounding the follicle. The granulosa cells lining the follicle hypertrophy as the vascular loops are projected in-

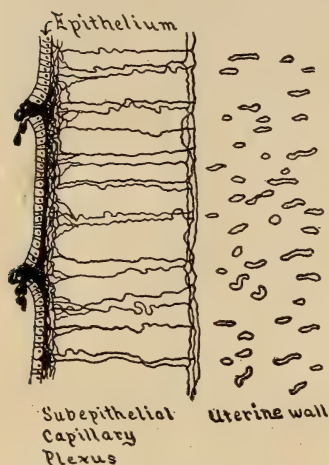


FIG. 79.—Schematic drawing to show the collection of blood beneath the surface epithelium and its escape at various points into the uterine cavity.

ward, and within the loops of the latter are carried toward the center, forming the lutein cells (corpus luteum, "yellow body"). When the cavity is completely filled in, the lutein cells appear large and well nourished, rich in protoplasm, with large, oval, prominent nuclei. The lutein cells serve as supporting structures until permanent connective tissue from the periphery is produced.

With the progressive proliferation of the new connective tissue the cells of the corpus luteum show evidence of fatty degeneration and undergo atrophy. The entire follicle gradually becomes filled with new connective tissue, forming the corpus albicans, which later undergoes hyaline changes and is finally absorbed either in whole or in part. After its escape from the follicle the ovum lies in contact with the contiguous surfaces of the pelvic peritoneum, Fallopian tube, intestine, omentum, or ovary. Just what position

the ovum occupies primarily is dependent on chance and is of no consequence. It floats in the capillary layer of peritoneal fluid between these structures, and is ultimately swept into the fimbriated extremity of the corresponding tube by the current produced by the action of the cilia. It has been demonstrated that minute foreign bodies in the peritoneal cavity are ultimately carried into the Fallopian tubes by the ciliary current. Occasionally the ovum of one side will be carried into the tube of the opposite side, a process known as external migration of the ovum; it is quite likely that its occurrence under normal conditions is not infrequent—it must take place in cases of pregnancy following removal of the ovary of one side and of the tube of the other.

Hitschmann and Adler have recently shown that periodic and regularly recurring anatomic changes in the mucous membrane of the uterus take place from one menstrual cycle to the next.

In the premenstrual stage (Fig. 75) the structure of the endometrium

more or less resembles a beginning formation of decidua; the superficial capillaries are engorged, the stroma is œdematous, the glands are enlarged, with swollen epithelium and diminished lumina. This period lasts from six to seven days.

The second cycle is the menstrual one (Figs. 73 and 76). The stage of secretion and hemorrhage lasts from four to six days, during which the glands discharge secretion, the superficial areas of the endometrium are infiltrated with blood, the superficial epithelium is detached, or the cells are separated in certain places permitting the menstrual blood to escape.

The third stage is the post-menstrual one (Fig. 74). In this stage the epithelial surface is repaired by the proliferation of cells, the blood-vessels shrink, and the stroma cells lose their œdematous character.

Fecundation.—The spermatic particles are capable, by their own activity, of making their way in the uterine cavity and the tubes at the rate of 1 cm. in three minutes. It is possible that their entrance into the uterus is facilitated by reflex movements of the organ at the time of emission. In some of the lower animals it has been observed that at this time the uterus descends into the vagina, the endometrial cavity becomes reduced in size, and the plug of cervical mucus is partly expressed from the external os. Immediately after the orgasm the uterus resumes its previous condition, during which process it aspirates into the uterine cavity a portion of the spermatic fluid that has combined with the cervical mucus, the alkaline

cervical mucus possessing a certain attraction for the spermatic particles. That this is the process that occurs in the human cannot be asserted positively, but it is not unlikely that such an occurrence takes place following the orgasm in the female. From the uterine cavity the spermatozoa, by their own motility, make their way to the outer third of the tube, where they lie in wait for the ovum. The ovum is fecundated by the penetration of one sperm-cell. The fertilized ovum then passes down the tube to the uterus, which it is said to reach within from three to seven days. The relation of ovulation to the menstrual periods is important in determining the time

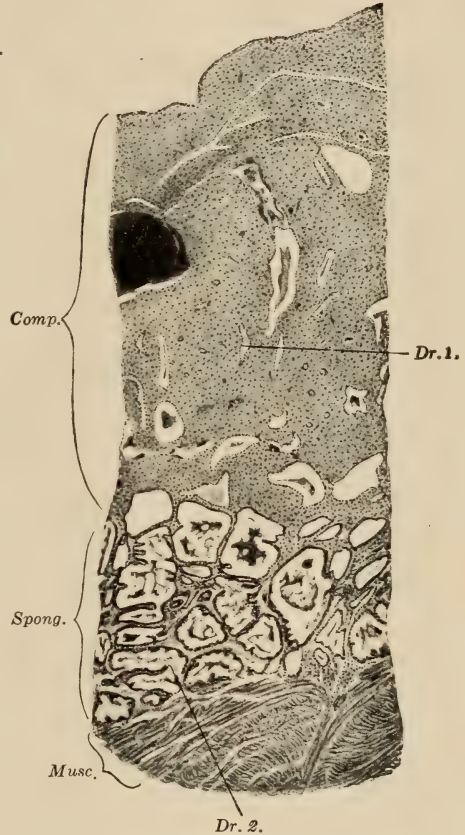


FIG. 80.—Showing the two layers of the decidua of the second month, decidua compacta and decidua spongiosa. (Keibel and Mall.)

when coitus will most probably be followed by conception. If ovulation occurs simultaneously with menstruation, it is evident that spermatic particles gaining entrance to the uterus and thence to the tubes immediately after menstruation will fecundate the recently discharged ovum and that pregnancy will date from the first coitus following the last normal menstrual period. If the more recently expressed view, that ovulation occurs within from fourteen to sixteen days after menstruation is correct, then, although the onset of pregnancy must be reckoned from the first day of the last menstrual flow, the duration of gestation is evidently shorter by a week than



FIG. 81.—Showing a gland duct of the decidua compacta of the second month, containing secretion, and surrounded by typical decidual cells and a few leucocytes. (Keibel and Mall.)

the classic period of two hundred and eighty days. In married women who have sexual intercourse at regular intervals it has been shown that the tubes commonly contain spermatic particles, and that, in consequence, a slight irregularity in ovulation may result in conception taking place at any time during the month. This irregularity explains the apparent variation in the duration of pregnancy that at times occurs.

Nidation of the Ovum.—As soon as fertilization occurs, certain changes take place in the endometrium; these have for their purpose suitable nidation and nourishment of the ovum. The endometrium becomes transformed into the membranous structure known as the *decidua*. The stroma cells of the endometrium become greatly hypertrophied, forming large, round, oval, or polygonal cells with large, lightly-stained vesicular nuclei—the *decidual cells*. This metamorphosis of the stroma cells occurs chiefly in the superficial part of the endometrium, and during the process the glands are crowded into the deeper part. The superficial area, composed of the decidual cells, is known as the compact layer of the decidua (*decidua compacta*), whereas the deeper area, made up of the distended and hyperplastic glands, is termed the spongy layer (*decidua spongiosa*) (Figs. 80 and 81).

When the fertilized ovum reaches the uterine cavity it finds the endo-

metrium transformed into a thick, succulent structure that serves admirably as a resting-place and as a source of nourishment (Fig. 82).

The ovum at this time has not progressed beyond the stage of development when the blastodermic vesicle is formed, and does not possess any villi. The cells of the outer surface of the vesicle, known as the chorion, rapidly proliferate and form large, irregular, multinucleated masses of protoplasm that have peculiar properties and that serve the double purpose of implanting and of nourishing the ovum. These cells, owing to their function, are known as trophoblasts, and possibly serve to convey nourishment to the ovum by osmosis merely through their contact with the decidua.

Their most peculiar characteristic is the corrosive action they exert on the decidua, eating their way into the specialized decidual tissue.

After a time, little shoots of connective tissue from the inner layer of the chorion project beneath the trophoblastic cells in the shape of finger-like processes and form the rudimentary villi (Figs. 85 and 86). The trophoblast covering the connective-tissue stalks is finally transformed into two layers of epithelium—an inner layer, made up of polygonal cells, and known as *Langhan's layer*, and an outer layer, made up of ribbon-like cells, termed the *syncytium*. As a result of the corrosive in-

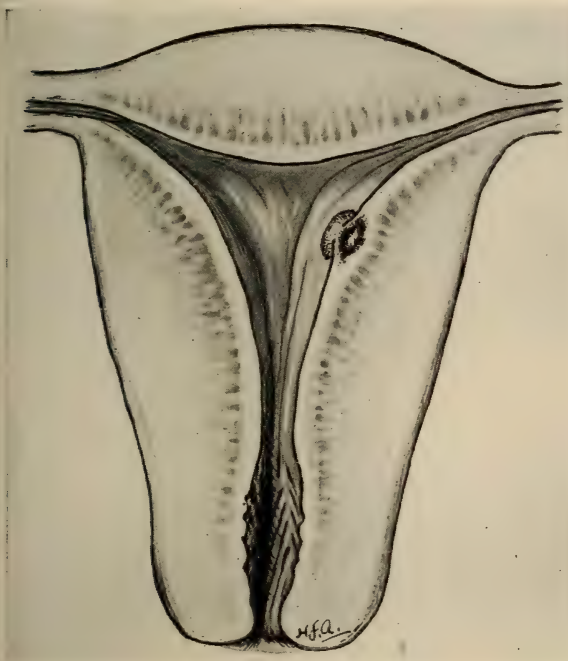


FIG. 82.—Semi-schematic drawing to show relative size of imbedded early ovum and uterus.

fluence of the trophoblast upon the decidua, the ovum penetrates and soon sinks into the depths of this structure, as a rule, at the upper part of the uterine cavity.

As the trophoblast eats its way through the decidual tissue it erodes the walls of the capillary vessels along its path and permits blood to escape between the contiguous borders of the decidua and the advancing trophoblast. Thus are formed the spaces filled with maternal blood—the earliest stage in the formation of the intervillous blood spaces of the future placenta (Fig. 87). Here and there a villus does not simply project or float, as it were, in the maternal blood, but passes to a more distant area and becomes securely embedded within the deeper layer of the decidua. These particular villi serve as points of attachment between the ovum and the maternal structures, and are known as the “fastening” villi.



FIG. 83.—A section through the Peters ovum and the surrounding portions of the uterine mucous membrane: (*Bt*) blood lacunae; (*Cu*) capillaries; (*m.Cha*) mesodermal axis of the first chorionic villi; (*Dr*) decidua compacta; (*E*) embryo; (*G*) maternal vessels; (*Sc*) syncytium; (*Sy*) syncytium; (*T*) trophoblast; (*Uz*) uterine epithelium; (*Uz*) zone of enclosure. The opening in the capsularis extends from *a* to *b*. $\times 50$. After Peters, 1899, Keibel and Mall.)

In time the chorionic villi become especially well developed in the area directly opposite the uterine wall. These villi cover that part of the chorion known as the *chorion frondosum*. This and the area of the decidua with which it is in relation (*decidua serotina*) together ultimately make up the placenta.

The placental space lies between the chorion frondosum and the decidua serotina, and contains maternal blood. The blood is separated from the capillaries of the fetal villi by the thin layer of specialized chorionic epithelium known as the syncytium. The only means of communication between the maternal and the foetal blood is by osmosis through the syncytial cells. There is also possibly a direct cellular participation of the syncytium in this exchange, which is compared by Williams to a similar process that takes place in the tubules of the kidney and in other organs.



FIG. 84.—Summit of the Peters ovum: (Bl) blood lacunæ; (Ca) capsularis; (Sc) closing coagulum; (St) its stalk; (Sy) syncytium; (Tr) trophoblast; (Ue) uterine epithelium; (Ue.R) the crumpled border of this; (a) trophoblast nucleus in the syncytium; (b and c) preparatory stages of the syncytium (wreath-like deposit in a blood lacuna.) (From Peters, 1899, Keibel and Mall.)

PREGNANCY

During the period of gestation the generative organs undergo a pronounced hypertrophy. The uterus, which, of course, is the organ most affected, increases from 6.5 to 7 cm. in length to 28 to 36 cm. There is an increase in capacity of more than 500 times, and an increase in weight of the organ of from one ounce to about two pounds (Figs. 88 and 89). The general enlargement is due to the increase in the size and in the number of the muscle cells, as well as of the blood-vessels, lymphatics, nerves, and elastic fibers. During the first half of pregnancy there is an actual hypertrophy of the constituents of the uterine wall. After this time the hypertrophic process ceases, and the thickened muscular sac becomes distended. The wall of the

uterus at term measures about 5 to 7 mm. in diameter. From the very beginning of pregnancy the hypertrophy of the uterus affects all parts quite equally, but as pregnancy advances the fundus is almost exclusively the portion affected (Fig. 90). One of the early indications of pregnancy, appearing from the

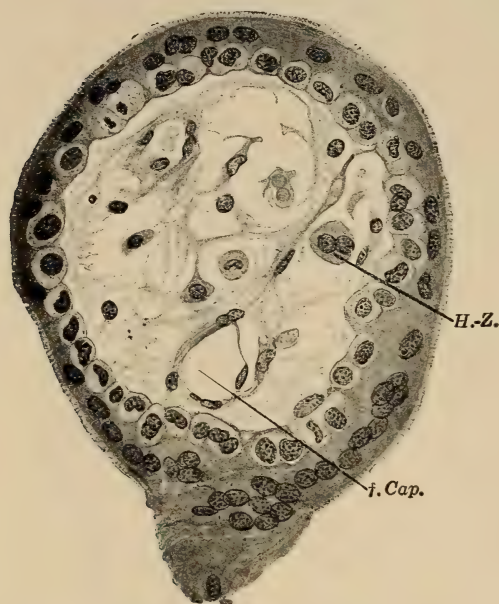


FIG. 85.—Chorionic villus from the second month; the syncytium provided with prickly processes: (f.Cap) foetal capillary: (H.-Z) Hofbauer cell. $\times 400$. (Keibel and Mall.)

sixth to the eighth week, consists in an excessive softening of the lower uterine segment, so that it may be difficult, on bimanual palpation, to detect the connection between the slightly enlarged cervix and the markedly hypertrophied and softened body. This condition constitutes what is known as Hegar's sign (Fig. 91). Beyond moderate hypertrophy and softening, the cervix itself remains unchanged until the last month of pregnancy, or even until the onset of the first stage of labor. The cervical glands secrete more actively, and the mucous discharge is increased. The ovaries do not functionate during pregnancy, but their vascularity is markedly increased. The *corpus luteum of pregnancy* is greatly enlarged and may occupy at least one-half of the ovary, projecting from the surface as a more or less permanent

hillock. It does not differ histologically from the menstrual corpus luteum, and its increased size has been attributed to the marked congestion of the vessels incident to pregnancy. Some authors, however, notably Fraenkel, believe that the corpus luteum is the actual secreting structure of the ovary and is directly concerned with the formation of the decidua and placenta and the nourishment of the early ovum. Later in pregnancy, when these changes have occurred, the corpus luteum undergoes atrophy. Fraenkel, by careful experimental investigations, has done much to substantiate his theory, and his views are now generally accepted. The vascularity of the Fallopian tubes is increased, and they undergo some hypertrophy. The vagina is more vascular, and its muscular and connective-tissue fibers become hypertrophied. The vaginal mucosa becomes thicker and softer. The distention of the abdominal wall by the pregnant uterus is marked in more than 90 per cent. of cases by the formation of the *striae gravidarum*. These striae are shimmering,

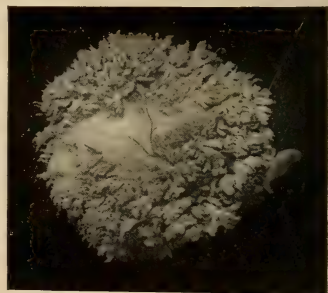


FIG. 86.—Human ovum, showing chorionic villi. (Specimen of Dr. G. A. Piersol.)



FIG. 87.—Anlage of the placenta from the second month. From a uterus obtained *per operationem*. The embryo had a vertex-breech length of 28 mm. (Ch.-P) chorion plate; (Dr) glands; (b.E) basal ectoderm; (Hz) anchoring villi; (M) muscularis uteri; (m.A) maternal artery in a placental septum (decidual pillar); (N.F) Nitabuch's fibrin stria; (R.F) Rohr's fibrin stria; (Z.-I) cell island. $\times 15$. Keibel and Mall.)

pinkish, bluish, or whitish depressed areas that appear at the sides of the lower abdomen and adjacent surface of the thighs. They are the result of overstretching, atrophy, or rupture of the deeper connective-tissue layers of

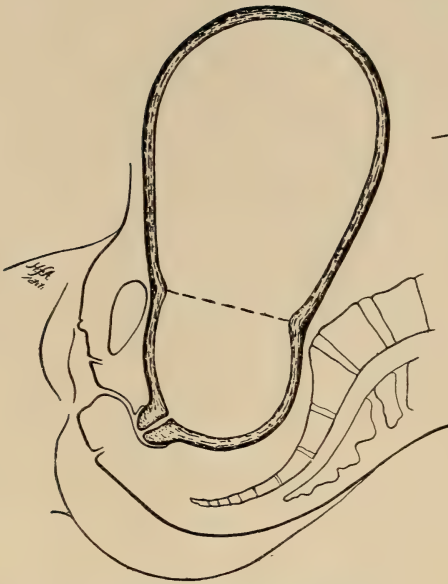


FIG. 88.—The pregnant uterus at term, showing the fundus, the lower uterine segment and the cervix. Schematic.

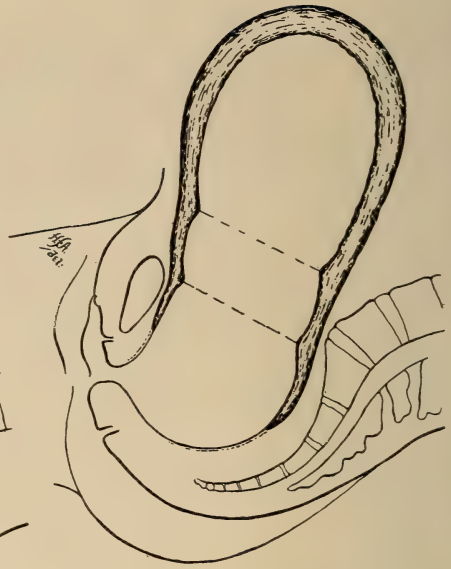


FIG. 89.—Pregnant uterus at end of first stage of labor; the upper uterine segment is the contracting part, the lower uterine segment and the cervix are the dilating parts.

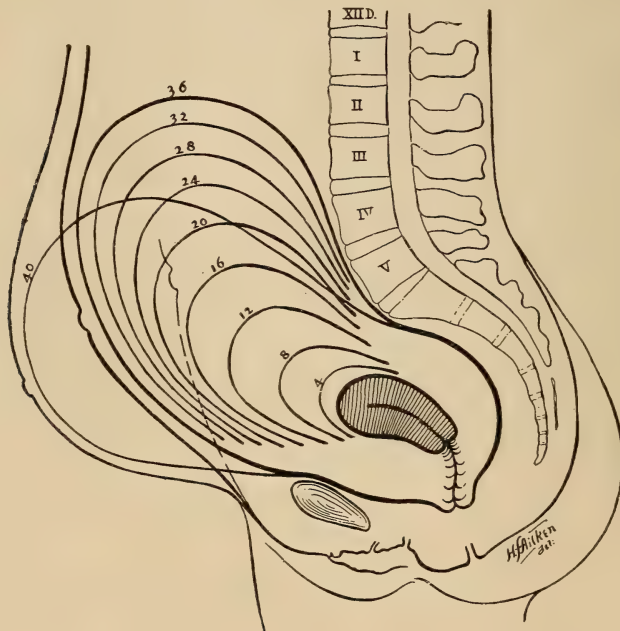


FIG. 90.—The height of the fundus of the pregnant uterus at different periods.

the skin. The pressure of the growing uterus frequently causes stretching of the linea alba and separation of the rectus muscles. Diastasis of the recti and thinning of the fascia are so marked at times that the anterior surface of the uterus is brought very close to the skin and is separated from it only by the attenuated fascia and peritoneum. During the latter months of pregnancy the enlarged uterus acts as an obstruction to the venous circulation,

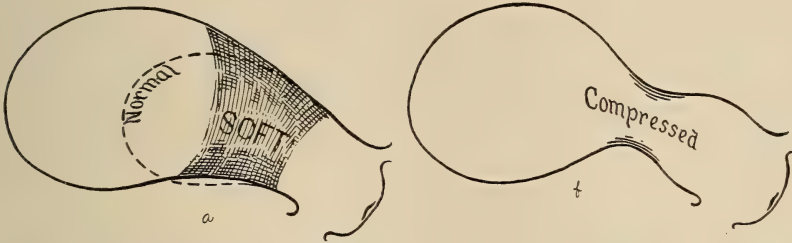


FIG. 91, *a* and *b*.—Showing the softening of the lower uterine segment of early pregnancy (Hegar's sign) and the extent to which the tissue may be compressed between the examining fingers.

so that enlargement and varicosity of the veins of the lower extremities are frequent and oedema is not unusual. As the uterus hypertrophies it presses more and more upon the bladder. Toward the end of pregnancy the bladder becomes elevated, and finally a considerable portion of it lies above the pelvic brim.

LABOR

Dilatation of the cervix may occur gradually during the last weeks of pregnancy or not until labor begins (Fig. 92). The internal os is the first to undergo dilatation, followed by a gradual, cone-like distention of the tissue surrounding the cervical canal. Finally the canal of the cervix becomes obliterated, and only the external os remains. The edges of the



FIG. 92.—Showing the gradual obliteration of the internal os and cervical canal at the end of pregnancy.

external os gradually become thinner and retracted over the advancing foetal parts. During this stage tears of the cervical tissue (Fig. 93), beginning at the thinned-out edges of the os, are not infrequent, and to a certain extent are almost physiologic (Fig. 94). As the head of the foetus is propelled through the pelvic canal by the force of the uterine contractions, assisted in the second stage by voluntary contraction of the abdominal muscles, it presses upon the structures that separate the uterovaginal canal from the pelvic bones. The lower uterine segment, cervix, vagina, bladder, rectum, and

muscles, fascia, nerves, and vessels of the pelvic wall are compressed to a degree corresponding to the relative disproportion in size between the bony pelvis and the child's head (Fig. 95). When the presenting part reaches the perineal floor the structures anterior to the vagina are forced forward against the posterior surface of the symphysis, and those that lie behind are pushed downward and backward and greatly stretched, finally forming the posterior and lateral boundaries of what is termed by Williams the "perineal gutter." As the head approaches the vaginal outlet the pressure on the lower part of the rectum causes the anus first to bulge and then to dilate and expose the mucosa of the anterior rectal wall. At the moment of birth the vaginal orifice is greatly overstretched and its borders are thin and tense (Fig. 96). Tears in the fourchette, in the mucosa, and in the edges of the

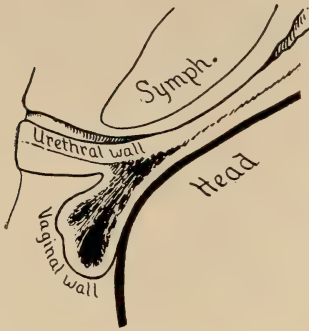


FIG. 93.—The vaginal wall being torn from its attachments and pushed forward by the advance of the fetal head during labor, a factor in the production of cystocele.

triangular ligament surrounding the orifice are common. If the disproportion is too great or expulsion occurs before the parts are fully dilated, rupture of the perineal muscles and fascia may occur.

The third stage of labor consists of separation and expulsion of the placenta. The placenta is detached from the uterine wall by the contractions of the uterus, which reduce greatly the placental area of attachment. The attached placenta follows the uterine contraction to a certain extent, but after it has become diminished in size as far as is compatible with its area of attachment, it leaves the uterine wall. The placenta and membranes are expelled by uterine contractions, such expulsion being aided in certain cases by bleeding and by the formation of a clot between the placenta and the uterine wall.

Abortion or miscarriage is a diminutive form of labor, since the foetus is smaller and there is less disproportion in size between it and the birth-canal. Traumatism is, therefore, reduced to a minimum, and may be almost entirely absent. Usually, however, there is some laceration of the cervix, but the perineum commonly escapes injury. The earlier the abortion, the more frequently is expulsion of the placenta attended by difficulty, artificial means being occasionally required.



FIG. 94.—Bilateral laceration and elongation of the anterior lip of the cervix. Sketch made few hours after spontaneous delivery of primipara. (Philadelphia Hospital.)

Portions of the placenta or decidua are retained in utero much more frequently in abortion than in labor at term.

THE PUERPERIUM

For five or six weeks following labor the uterus and the other pelvic organs that hypertrophied during pregnancy become the seat of regressive changes that permit them to approximately return to their previous normal condition. This period is known as the puerperium, and the regressive process as involution. Involution is accomplished by atrophy of the muscle cells, obliteration of many of the vascular channels, and absorption of the tissue

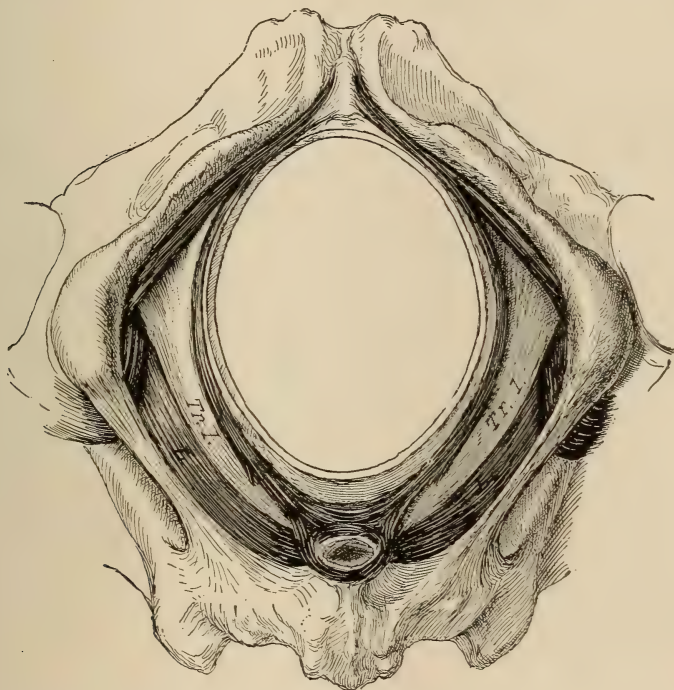


FIG. 95.—Distention of the perineal muscles by the birth of the head.

juices. It affects the uterus, uterine ligaments, ovaries, tubes, abdominal walls, cervix, vagina, and perineum. These parts never return absolutely to their former state, but retain certain marks or indications of the pregnancy. The completeness of involution is dependent upon the proper management of labor and the puerperium and upon the general health of the patient. Involution may be retarded by accidents during delivery, by infection, by retention of the membranes and placenta, by insufficient or improper care, *e.g.*, too early resumption of activity, heavy lifting, and the like, and by general debility and lack of tone.

During the first ten days or two weeks of the puerperium a bloody vaginal discharge, known as the *lochia*, is present. This at first consists of

pure blood, but later becomes mixed with shreds of decidua, bits of membrane, leucocytes, and epithelium. The bloody constituent grows less and less until the tenth day, when, as a rule, the discharge is made up wholly of leucocytes and epithelial debris. The lochia diminishes progressively in quantity and finally ceases. Commonly, however, after a woman has borne a child, there is a slightly increased secretion from the vagina. This is due to the slight hypertrophy of the uterus and its glandular constituents which often persists.

THE MENOPAUSE

The menopause, climacteric, or change of life occurs at about the forty-fifth year. It corresponds to the end of ovulation and the exhaustion of the

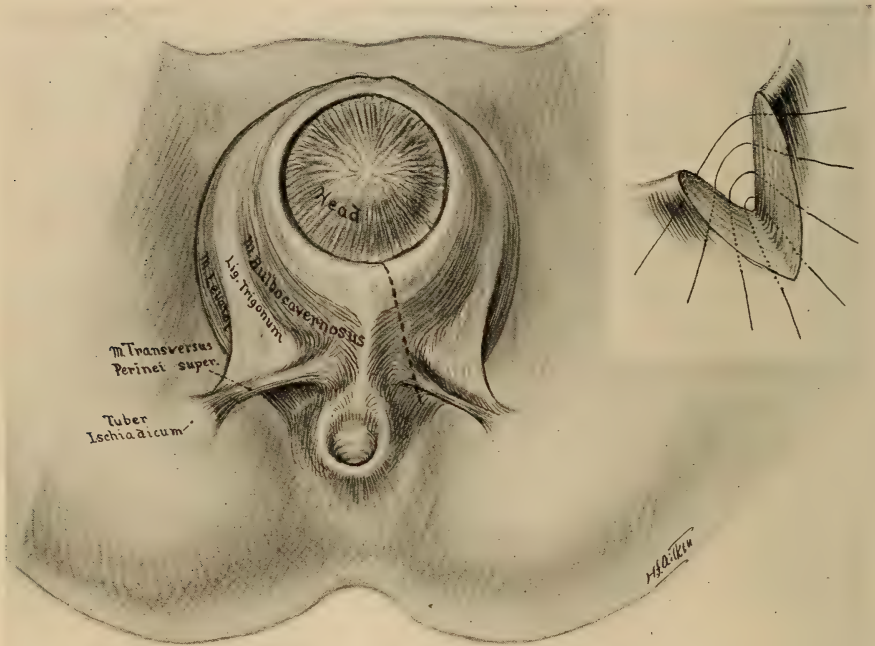


FIG. 96.—Showing the distention of the perineum just before the birth of the head and the episiotomy incision and scheme of closure.

primordial follicles in the ovary. The internal secretion of the ovaries fails, the uterus and the other generative organs atrophy (Fig. 97), menstruation ceases, and conception is no longer possible. In other words, the reproductive period of the woman's life is at an end. The menstrual flow may cease abruptly or may gradually decrease in amount, or the intervals between the menstrual epochs may become longer. Normally, the amount lost at each period is diminished and the number of periods are lowered, not increased. Accompanying the abrupt or gradual cessation of menstruation certain nervous symptoms appear that are believed to result

from the cessation of the internal secretion of the ovary. These symptoms consist of periodic vasomotor relaxation affecting the entire body, particularly the upper extremities and face, and described by the patient as sensations of heat or "flashes." General nervous symptoms and perversions of inclination and disposition are also observed. Ordinarily, the menopausal disturbances subside within one or two years. They vary considerably in degree, being exaggerated in some patients and scarcely noticeable in others. There is often a general increase in the development of adipose tissue. The vulvar and vaginal mucosa loses its flexibility and becomes attenuated, inelastic, and tender. The vulva atrophies, and the vaginal orifice and vaginal canal contract. The slightest trauma, mechanical, chemical, or thermal, may give rise to a vulvovaginitis. The atrophy of the genitalia may be associated with exaggeration of a previously existing cystocele, rectocele, or malposition of the uterus.



FIG. 97.—Atrophic changes in a senile uterus with shrunk appendages of the left side. From a woman aged sixty-eight years. The tube and utero-ovarian ligament appear abnormally elongated. (Gynecological Laboratory, U. of P.)

The menopause may occur prematurely from early exhaustion of the ovary, the result probably of deficient development. In these cases the menses disappear gradually or suddenly, and nervous symptoms are prone to be marked. A premature menopause is usually associated with obesity and with other evidences of hypoplasia of the genital organs, *e.g.*, late puberty, scanty menses, and sterility. Deficiency or abnormality of the secretion of the other ductless glands appears at times to be associated with a premature menopause.

The menopause may be brought on abruptly by operations that remove the ovaries and thus deprive the body of their internal secretion. In these cases the menses do not reappear, and the patient often suffers severely from "hot flashes," nervousness, headaches, and the like. In a neuropathic individual pronounced psychosis may take place.

The Excretions of the Genitalia.—The excretory products of the glands of the genital tract vary in their nature and purpose. Upon the external and hairy surfaces, as elsewhere in the body, there is an excretion of sebaceous matter and perspiration. The more delicate inner surfaces of the vulvar

mucosa are kept moist by the thin, mucous excretion of the vestibular and Bartholinian glands. The cervical glands excrete a thick mucus which plugs the cervical canal, and which, while serving to prevent the entrance of bacteria, attracts the spermatic particles. The so-called vaginal secretion consists of desquamated epithelium from the vagina mixed with mucus from the cervix. The secretion of the endometrial glands is greatest just before and at the time of the menses; mixed with blood it forms the menstrual fluid.

THE URINARY ORGANS.

The Ureters.—The ureters are tubes that serve to convey urine from the pelvis of the kidney to the bladder. This function is partly due to gravity, but occurs mostly as the result of the peristaltic muscular contractions of the ureteral wall. Inspection of the ureteral orifices during cystoscopic examination shows that periodic spurts occur at more or less regular intervals. The discharge of urine is preceded by a relaxation of the ureteral opening and by a vermicular motion of the vesical part.

Backflow of urine from the bladder to the ureter is prevented by compression of the vesical ureter incident to distention of the bladder, and a valve-like approximation of the margins of the ureteral openings. Backflow into the urinary tubules from distention of the kidney pelvis is prevented by compression of the renal pyramids and closure of the tubules.

The Bladder.—The bladder is the reservoir in which the urine collects, and by which organ it is expelled. The base, including the trigone, is more or less fixed, being attached to the anterior vaginal wall and the cervix. The apex, on the contrary, is free, and as the bladder fills it rises into the pelvic cavity, pushing the body of the uterus, which lies in contact with it, upward and backward. After evacuation is completed the summit sinks again into the lower and more fixed vesical areas. The urine is retained in the bladder up to a certain degree of distention by the elasticity of the fibers surrounding the urethra and by the sphincter muscle. Beyond that point the vesicospinal center is excited, and a contraction of the unstriated vesical muscle is produced through the motor nerves. After the age of infancy this process is influenced by a voluntary inhibition of the vesical center and contraction of the urethral sphincter. The sensory excitator-reflex nerves of the bladder may, also, be stimulated, even though there is but moderate distention of the viscus by voluntary contractions of the striated muscles of the urethra, the floor of the pelvis, or the abdominal wall, or by the irritation of sensory nerves, as by tickling or by the sound of running water or whistling. The vesical center may also be stimulated by tumors and by malpositions and adhesions of the pelvic organs that produce traction or pressure upon the bladder. Frequency of urination is a common symptom of gross pelvic disease, even where the urine is normal and no cystitis is present.

The Rectum.—The rectum is the lower part of the large intestine which serves as a receptacle for the feces, from which they are expelled by muscular action. The intestinal contents are inspissated higher up the intestinal canal, and formed into a fecal mass. Above the rectum the feces give no sign of their presence, but as soon as they enter the rectum the anospinal center in

the lumbar cord is excited and energetic peristalsis is induced. As the fecal mass enters the anal canal a voluntary inhibition of the sphincter ani muscles permits these structures to relax and a portion of the fecal mass to pass through the canal. Immediately thereafter contraction of both the levator ani and the sphincter ani muscle occurs. The direction taken by the fibers of the levator ani muscles makes it possible for them to aid the sphincter in closing the anus immediately after a portion of the fecal contents has been expelled. The external sphincter is prevented from being pulled forward by its attachment to the coccyx, so that its contraction, plus the elevating action of the levators, results in a sort of cut-off action at the rectal outlet. Defecation may be controlled for a time by voluntary contraction of the external sphincter, but peristalsis may be so energetic as to offset the strongest voluntary contraction. Expulsion of the feces is usually assisted by voluntary contractions of the muscles of the abdominal wall, together with inspiratory depression of the diaphragm.

Constipation and difficult and painful defecation are not uncommon consequences of pelvic disease. Rectal irritability and a frequent desire to empty the bowel are notably observed in cases of extrauterine pregnancy with pelvic hæmatocele.

BIBLIOGRAPHY

- American Gynecological Society, 1917. Symposium on "The Relation of the Glands of Internal Secretion to Gynecology and Obstetrics." FRANK, GÖETSCH, MCCORD, VÖEGTLIN, POOL, MARINE, PAPPENHEIMER, GRAVES, MORLEY.
- ARNOLD: "Ueber das zeitlichen Verhältniss der Ovulation zur menstruelle Blutung." Inaug. Dissert., Würzburg, 1897.
- BELL, W. B.: "Causes of Noncoagulability of Normal Menstrual Blood and of Pathologic Clotting." J. Path. and Bact., 1914, xcii, p. 462.
- CLARK, J. G.: "The Origin, Development and Degeneration of the Blood-Vessels of the Human Ovary." Bull. Johns Hopkins Hospital, 1899, x, p. 40. *Ibid.*: "The Origin, Growth and Fate of the Corpus Luteum," *loc. cit.*, 1898, vii, 181. *Ibid.*: "The Anatomical Basis of Ovulation and Menstruation." Trans. Amer. Gyn. Soc., 1911, vol. xxxvi, p. 265.
- DAS, KEDARNATH: Handbook of Obstetrics. Butterworth & Co., Calcutta, 1914.
- DIENST, A.: "Die Ursache für die Gerinnungsunfähigkeit des Blutes bei der Menstruation." München. med. Wchnschr., 1912, lix, 2799.
- EDGAR, J. C.: Practice of Obstetrics. Blakiston, Phila., 1913.
- EHRENFEST, HUGO: "The Influence of the Central Nervous System in the Causation of Uterine Hemorrhage." Am. Jour. Obst., 1908, lvii, p. 161.
- ENGELMANN, G. J.: "Das Alter bei der ersten Menstruation, Am Pol und Am Aquator." Centralbl. f. Gynäk., 1902, No. 46, 1125.
- FINDLEY, P.: "Menstruation Without Ovaries." Trans. Amer. Gyn. Soc., 1912, vol. xxxvii, p. 82.
- FRANK, R. T.: "The Clinical Manifestations of Diseases of the Glands of Internal Secretion in Gynecological and Obstetrical Patients." Surg., Gynec., and Obst., 1914, xix, p. 618. *Ibid.*: "The Function of the Ovary." Trans. Amer. Gyn. Soc., 1911, vol. 36, p. 269. *Ibid.*: "The Placenta Regarded as a Gland of Internal Secretion." *Loc. cit.*, 1917, vol. 42, p. 240.
- FRAENKEL, L.: "Die Funktion des Corpus Luteum." Arch. f. Gynäk., vol. lxxviii, p. 438. *Ibid.*: "Neue Experimente zur Funktion des Corpus Luteum." Arch. f. Gynäk., 1910, vol. xci, p. 705. *Ibid.*: "Ovulation, Konzeption und Schwangerschaftsdauer." Ztschr. f. Geburtsh. u. Gynäk., 1913, vol. lxxiv, p. 107.
- GEBHARD, C.: "Ueber das Verhalten der Uterusschleimhaut bei der Menstruation." Ztschr. f. Geburtsh. u. Gynäk., 1895, vol. xxxii, p. 296. *Ibid.*: "Die Menstruation." Handbuch d. Gynäkologie, J. Veit, Wiesbaden, 1897, vol. iii, part 1, p. 18.
- GELHORN: Discussion. Trans. Amer. Gyn. Soc., 1917, vol. xlii, p. 317.
- HIS: "Anatomie menschlichen Embryonen." Abth. i, v, ii, Leipzig, 1882.

- HITSCHMANN AND ADLER: "Der Bau des Uterusschleimhaut." Monatschr. f. Geburtsh. u. Gynäk., 1908, vol. xxvii, No. 1.
- KEIBEL, FRANZ, AND MALL, FRANKLIN P.: Manual of Human Embryology. Lippincott, Phila., 1910.
- KISCH, E. HEINRICH: Das Geschlechtsleben des Weibes. Urban, Berlin, 1907.
- KOLLMANN, J.: Handatlas der Entwicklungsgeschichte des Menschen. Fischer, Jena, 1907.
- LANDOIS, L.: Text-Book of Human Physiology. Blakiston, Phila., 1904.
- LEOPOLD AND MIRANOFF, M.: "Beiträge zur Lehre von der Menstruation und Ovulation." Arch. f. Gynäk., 1893-94, xiv, 506.
- MEYER, R., AND RUGE, C.: "Ueber Corpus Luteum Bildung und Menstruation in ihrer zeitlichen Zusammengehörigkeit." Centralbl. f. Gynäk., 1913, xxxvii, 1st half, 50.
- NOVAK, EMIL: "The Corpus Luteum." J. A. M. A., 1916, vol. lxvii, p. 1285. *Ibid.*: "The Superstition and Folklore of Menstruation," *loc. cit.*, vol. xxvii, No. 307, September, 1916.
- OTT, D. v.: "Gesetz der Periodicität der physiologischer Funktion in weiblicher Organismus." Bericht. über die Verhand. d. X. Int. Med. Cong., Berlin, 1890, Centralbl. f. Gynäk., 1890, Beilage, 31.
- PETERS: "Schwangerschaftsdauer." Centralbl. f. Gynäk., 1915, vol. xxix, 1st half, 261 and 276; *Ibid.*: "Ueber die menschlichen Eies." Deuticke, Leipzig und Wien, 1899.
- SCHROEDER, R.: "Ueber der zeitlichen Beziehungen der Ovulation und Menstruation." Arch. f. Gynäk., 1914, vol. ci, p. 1.
- STENGEL, A.: "Ovulation and Menstruation." Univ. Med. Mag., 1891, iii, 233.
- WILLIAMS, J. WHITRIDGE: Obstetrics. Appleton, New York, 1912.

CHAPTER V

THE CAUSES OF PELVIC DISORDERS

DISEASES of the female genital tract may be either inherited or acquired. Congenital disorders may be evident at birth or may appear later—at puberty, during the reproductive period, at the menopause, or even later. Among the *congenital disorders that are evident at birth* are gross malformations or tumors; *those that manifest themselves at puberty* are such conditions as prevent the normal establishment of menstruation; *those that appear first during the reproductive period* are such as obstruct or complicate reproductions, or tumors, as, for example, fibroids and sarcoma. *Congenital diseases developing later* include true ovarian cysts or solid tumors or possibly carcinomata (if these can be considered as congenital).

In addition to these congenital or inherited disorders pelvic diseases may have their origin in general or constitutional lesions that affect the pelvic structures indirectly—as, for example, *anæmia* or *heart disease*, which influence the pelvic circulation and the menstrual flow, or directly, as in certain metastatic infections, such as oöphoritis following *mumps*, or a *tuberculosis* of the tubes secondary to a tuberculous focus elsewhere in the body. Atresia of the vagina the result of the *exanthemata* of childhood may, upon discovery in later life, appear to be congenital, but in reality is an acquired lesion.

Functional disorders, such as severe dysmenorrhœa associated with irregular and scanty periods, may also be congenital. They are the evidences of an underdevelopment of the genitalia, a condition frequently associated with chlorosis and an arrested development of the entire cardiovascular system. These painful and distressing functional disorders may also be acquired as the result of ill-health and of arrested growth and development after the individual has attained the age of puberty. Even after adult life has been reached, depressing conditions of body and mind, such as tedious sedentary occupations, insufficient exercise, faulty hygienic conditions, prolonged worry, improper food, may give rise to the symptoms of functional disorders.

An unnatural sexual state may also play a part in these conditions. Celibacy and ungratified sexual impulses, even though subconscious, may influence the menstrual function and upset the nervous balance of the individual.

Pain at the menstrual periods (dysmenorrhœa), if chronic, may induce permanent manifestations of nervous irritability, exhaustion, and depression, even in persons not predisposed to nervous disease.

In many individuals an unstable nervous organization is associated with dysmenorrhœa of the so-called essential or neurotic type, that is, dysmenorrhœa having no anatomic basis other than a hypoplasia. In these cases the dysmenorrhœa aggravates the neurotic condition and leads to nervous irritability, exhaustion, and depression.

Amenorrhœa and menorrhagia may in turn produce or be produced by

nervous disorders. Amenorrhœa and the fear of tuberculosis, menorrhagia and the dread of cancer, may tend to produce psychoneurotic conditions. So, too, the fear of impregnation or the desire for conception may cause amenorrhœa, whereas sudden mental shocks and other nervous disturbance may be the underlying cause of menorrhagia (Ehrenfest).

Possibly the largest group of pelvic diseases are those due to pregnancy and labor or to their complications. In this class belong ectopic development of the ovum, the traumatism incident to labor and the results of such injury, and the infections that follow labor or miscarriage.

Certain tumors of the genital tract have their origin in the rests of embryonic organs or structures that ordinarily remain inactive. In this class may be included the true glandular cysts of the ovary, parovarian cysts, and adenomyomata outside the uterus.

Carcinoma may affect any portion of the genital tract. When it attacks the vulva, it usually occurs late in life, and is often a sequel to leucoplakia vulvæ. Carcinoma of the vagina is generally secondary to carcinoma of the cervix or of the body of the uterus. Carcinoma of the cervix is most common in women who have borne children, giving rise to the belief that trauma of the cervix plays an important rôle in its production. Carcinoma of the body of the uterus often follows in the wake of myoma of the uterine wall. Carcinoma of the ovary frequently results from degeneration of a glandular cyst. The etiology of malignant growths of the genital tract, as elsewhere in the body, is obscure. Some investigators regard them as the end-results of infection by a microorganism or a parasite, a theory that has not been borne out by facts.

Fibroid tumor is possibly always congenital in origin, the original nidus from which the tumor grew having been present in the genital tract at the time of birth. It is an assured fact that some of these tumors never increase in size or produce symptoms. Why this is so has never been discovered.

Dermoid tumors of the ovary are teratomatous inclusions that have existed since foetal life.

Chorioepithelioma is a term applied to a malignant degeneration of the chorionic villi of an antecedent pregnancy.

Infections incident to sexual life, such as gonorrhœa, syphilis, and chancroid, especially the first, are responsible for many forms of pelvic disease. Syphilis is much more frequent in the female than has generally been supposed. It gives rise to definite lesions of the external genitalia and the cervix, and affects the functions of the genitalia in many ways.

The bacteriology of the generative tract is of considerable importance in this connection, for inflammatory diseases occupy a prominent place among the pathologic conditions to which the generative tract is subject. Some of the bacteria that produce pathologic lesions in the genitalia are those which are found normally in the alimentary tract and upon the skin surface of the vulva and perineum. Any of the usual inhabitants of the mouth and nasopharynx may find their way into the stomach, but many of them never survive the action of the gastric juice. The duodenum and small intestine contain fewer organisms than the large intestine, where they are very numerous.

The most common intestinal form of bacteria is the bacillus coli com-

munis. Other less well-known varieties are the *bacillus lactis aërogenes* and *bacillus fecalis alcaligenes*. The *streptococcus pyogenes*, *staphylococcus aureus* and *albus*, and *bacillus pyocyaneus* are often present in the intestinal tract, the surface of the perineum, and the external genitalia. All the intestinal bacteria may be found in greater or lesser numbers on the skin in the region of the anus, perineum, external genitalia, and groin.

The vagina is the habitat of a rod-shaped bacillus described by Döderlein, and known as the *bacillus döderleini*. This bacillus is anaërobic and has an acid secretion. By reason of their secretion the vaginal organisms exert a bactericidal action upon the pathogenic bacteria that are deposited there, unless, by reason of the excessive numbers or virulence of the latter the bactericidal properties of the Döderlein bacilli are overcome.

The normal endometrium and tubes are sterile. The organisms most frequently responsible for the occurrence of pathogenic changes in the genitalia are the *gonococcus*, *streptococcus pyogenes*, *staphylococcus albus* and *aureus*, *colon bacillus*, and *tubercle bacillus*. The *gonococcus* is transmitted by sexual contact; the *streptococcus* and *staphylococcus* are introduced into the genital tract as the result of examination or instrumentation; the *colon bacillus* is either introduced by manual or instrumental examination, or reaches the tubes by way of the adjacent intestinal walls.

A tuberculous infection of the genitalia is usually secondary. It is generally a hæmatogenous infection, and reaches the tubes by way of the bloodstream. Other more or less accidental infections with almost any pathogenic organism may occur. Thus the diphtheria bacillus, pneumococcus, *bacillus pyocyaneus*, *bacillus aërogenes capsulatus*, typhoid bacillus, and *streptothrix actinomyces* may all occasionally find lodgment in the genital tract and set up an active inflammation.

Aside from the tuberculous infections, however, we are most concerned with *gonococcus* infections, on the one hand, and with *streptococcus* and *staphylococcus* infections on the other. This is due to the difference in the behavior of the two types of organisms when deposited in the genital tract, and to the difference in the clinical history, symptoms, and course of the two forms of infection they produce.

Although the *gonococcus* lodges only in delicate epithelium, any break or abrasion of the mucous membrane, no matter how trifling, may form a nidus for the invasion of the *streptococcus* and the *staphylococcus*. The *gonococcus* reaches the pelvic structures by extension along a mucous surface; the other organisms, on the contrary, are prone to extend directly through the lymph-channels leading from the area in which they were originally deposited. For example, both the *gonococcus* and the *streptococcus* may be deposited directly within the uterus, and thus infect the endometrium, but the *gonococcus* infection will reach the tubes by extension along the mucosa, whereas the *streptococcus* will penetrate the uterine wall, pass into the broad ligament, and reach the tube from the outside, involving the peritoneal surfaces exclusively before invading the mucous membranes. The *gonococcus* usually leaves the ovary uninjured, except for the local irritation it produces in the adjacent tissues and the gross deposits of a surrounding peritonitis. A *streptococcus* or a *staphylococcus* infection, on the other

hand, very often attacks the ovary directly, penetrates the ovarian stroma, and produces an abscess. It may also be the cause of abscess formation of the broad ligament or of the uterine wall.

BIBLIOGRAPHY

- BUMM: *Der Mikroorganismus d. gonorrh. Schleimhaußerkrankungen*. Wiesbaden, 1885.
- CURTIS, A. H.: "The Etiology and Bacteriology of Leukorrhea." *Surg., Gyn., and Obst.*, 1914, xviii, p. 299.
- DÖDERLEIN: *Das Scheidensekret und seine Bedeutung für das Puerperalfieber*. Leipzig, 1892.
- DUCREY: "Experimentelle Untersuchungen über das Kontagium des weichen Schankers." *Monats. f. prakt. Dermat.*, 1889, Bd. 9, S. 221.
- ESCHERICH, TH.: *Darmbakterien des Säuglings und ihre Beziehung zur Physiologie der Verdauung*. Stuttgart, 1885.
- HARADA, TAKASHI: "On the Nature of the Bactericidal Property of Vaginal Secretion." *Amer. Jour. Med. Sci.*, 1916, vol. clii, p. 243.
- HUNNER: "The Streptococcus in Gynecology." *Amer. Gyn. and Obst. Jour.*, May, 1901, vol. xviii, p. 404.
- KOCH: "Die Aetiologie der Tuberculose." *Berlin. klin. Wochenschr.*, 1882, Bd. xix.
- LITTLE, H. M.: "The Bacteriology of the Puerperal Uterus." *Amer. Jour. Obst.*, 1905, vol. lii, p. 815.
- MENGE UND KRÖNIG: *Bakteriologie des weiblichen Genitalkanals*. Leipzig, 1897.
- NEISSER: "Die Mikrokokken der Gonorrhoea." *Deutsche med. Wochenschr.*, 1882, Bd. viii, S. 279. *Ibid.*: "Ueber eine der Gonorrhoea eigenthümliche Micrococcusform." *Centralbl. f. d. med. Wissensch.*, 1879, Bd. xvii, S. 497.
- OPITZ: "Bakteriologische Uterus-Untersuchungen." *Cent. f. Gynäk.*, 1897, No. 52, 5, 1505.
- PENROSE, C. B.: *A Text-Book of Diseases of Women*. Saunders, Phila., 1900.
- PLOSS, H.: *Das Weib in der Natur und Völkerkunde*. Grieben. Th. Leipzig, 1905.
- SCHAUDINN, F.: "Zur Kenntniss der Spirochete Pallida." *Deutsch. med. Wochenschr.*, 1905, No. 42, p. 1665.
- WALTHARD: *Handbuch d. Geburtsh.*, v. Winkel, vol. iii, 2.
- WILLIAMS, J. W.: "The Bacteria of the Vagina and Their Practical Significance." *Amer. Jour. Obst.*, 1898, vol. xxxviii, p. 449. *Ibid.*: "Tuberculosis of the Female Generative Organs." *J. H. H. Reports*, 1893, vol. iii, p. 85.

CHAPTER VI

HISTORY-TAKING AND SYMPTOMATOLOGY

TAKING the history of the case forms an important preliminary to the physical examination. In order to direct his inquiries intelligently and to separate the important from the unimportant, the interrogator must be thoroughly familiar with the normal anatomy and physiology of the generative organs, as well as with the nature and course of the pathologic conditions that are common to them (Fig. 98).

The patient is often timid and apprehensive, and the physician's manner should be such and the questions be so put as not to offend, alarm, or excite her. A badly-chosen question may be misconstrued by a nervous woman and throw her into a state of the greatest agitation. It is a good plan, therefore, to let the patient tell her story in her own way. This invariably gives her the assurance that an interest is being taken in her case, and paves the way for most searching questions later on. While she is giving an account of her sufferings, the physician has an opportunity to learn the patient's temperament—whether she exaggerates or minimizes her symptoms, whether she is depressed or buoyant in nature, and be enabled to determine the course to be pursued in order to obtain her fullest confidence.

A printed form may be utilized in recording the facts elicited, although a blank with suitable spacing for each subject in every case is often impracticable, for what is irrelevant to one case may be most pertinent to another. In order, however, to preserve system and to secure uniformity it is necessary that the data be recorded under separate headings.

Chief Complaint.—The examiner should bear constantly in mind the particular symptom or group of symptoms that have led the patient to consult a physician and from which she desires to secure relief. Thus an excellent anatomic result may be secured as the result of an operation to correct the position of the uterus, and yet, if the patient's chief complaint was of vesical irritability due to a urethral caruncle, or of backache the result of a sacroiliac sprain, she may consider her condition as unimproved. In making the diagnosis and prescribing the treatment attention should, therefore, be focussed on the most troublesome symptom. To this should be added the minor complaints, the number of which may give some indication of the patient's general condition and of her tendency to exaggerate or minimize her symptoms.

Age and Social State.—The age of the patient, whether she appears to be older or younger than the given age, whether she is single, married, or widowed, are points to be elicited at the beginning of the examination or later. It is often wise to postpone these inquiries for a time. If the patient is single, some idea as to whether or not she is virginal may be gained from her personality and occupation. These data are all of considerable importance, since there are certain diseases that are more common at cer-

Name	Age	, S. M. W.	Color	Born	Consulted at
Address		Referred by			Date
Chief Complaint					
Menses began at ; type established by ; menstrual type: recurrence every ; duration ; quantity ; pain					
Variation in menses at ; possibly the result of					
Menses at present: recurs every ; duration ; quantity ; pain ; Last period					
Leucorrhea since ; occurs ; amount ; color ; consistency					
Married at age of ; pregnancies					
Labors ; date of each ; character of labor ; complications of labor					
Complications of puerperium					
Miscarriages , duration of pregnancy and date of each					
Probable cause complications during or after miscarriage					
Previous Diseases Treatment or Operations					
Parental or Family Disorders					
Present Symptoms developed					
Were attributed by patient to are possibly attributable to					
Symptoms referable to pelvis, including generative organs, bladder and rectum					
Symptoms referable to stomach, gall bladder, appendix, intestines and kidneys					
Symptoms referable to { Heart Lungs Nervous system					
General Examination		Weight	; temp.	; pulse	; respirations
Blood Examination		urinalysis			
Heart		lungs			
Pelvic Examination		Vulva	; vaginal outlet	; urethra	; vulvo vaginal glands
Ant. vaginal wall		post. vaginal wall	; perineum		; anus
Uterus					
Right adnexa					
Left adnexa					
Abdominal Examination					
Diagnosis					
Treatment					

FIG. 98.—Form of History.

tain ages and in certain social states. Before the age of puberty, but few gynecologic conditions occur, since the genital organs are still undeveloped, and the usual causes of pelvic disorders are absent. Among the diseases encountered in infants are gonorrhœal vulvovaginitis, the result of accidental infection, and a grape-like sarcoma of the cervix; in older children malignant tumor of the ovary may develop, and tuberculous salpingitis and peritonitis secondary to tuberculous foci elsewhere may arise. Inflammation of the endometrium is occasionally a complication of the acute infectious diseases, such as pneumonia, typhoid fever, and dysentery; ovaritis may complicate mumps, scarlet fever, or small-pox, and gynatresia, first discovered after puberty, has been definitely traced to inflammatory lesions of the genital tract complicating typhoid fever, small-pox, dysentery, typhus, pneumonia, erysipelas, scarlatina, diphtheria, and measles.

After puberty and during adolescence, various disorders incident to the establishment of the menstrual function may arise. These may be due to actual anatomic lesions in the pelvis, such as hypoplasia of the ovaries and uterus, stenosis and pathologic anteflexion of the cervix; dysmenorrhœa or general diseases that affect the menstrual flow, *e.g.*, chlorosis and cardiac insufficiency; amenorrhœa, scanty menstruation, menorrhagia, and metorrhagia.

In the case of virgins between the ages of twenty-one and forty the lesions due to gonorrhœa—except accidental infection (extremely rare)—pregnancy, and childbirth may be excluded. Hyperplasia of the endometrium, cervical polyp, and congenital erosion or lacerations of the cervix may give rise to leucorrhœa. General ill health, asthenia, and nervous exhaustion may manifest themselves in painful menstruation and scanty flow. Cardiac insufficiency, fibroid tumor, or endometrial polyp may give rise to menorrhagia.

Between the ages of twenty-one and forty, in the married or in the non-virginal female, any of the lesions that result from a gonococcus infection or from pregnancy, with its sequelæ, may occur. Among these are pelvic inflammatory diseases, uterine displacements, cervical lacerations, and relaxation of the pelvic floor. Fibroid tumors affect frequently those who have not been pregnant.

Between the ages of forty and sixty the most common lesions encountered are ovarian cyst, carcinoma of the cervix or of the fundus, descensus or prolapsus uteri, hypertrophy of the cervix, and the late stages of cystocele and rectocele. Cervical carcinoma rarely occurs in those who have not borne children, whereas cancer of the body of the uterus, either alone or combined with fibroid tumor, may occur in sterile women.

Occupation and Habits of Life.—These should be carefully investigated. Improper food, faulty personal hygiene, a lack of fresh air and sunlight, and the depressing grind of uncongenial or exacting work will affect the general health and may give rise to painful and scanty menstruation. The woman who has insufficient help, who lifts heavy burdens, and who continually sacrifices herself for the good of her household is predisposed to subinvolution, displacement of the uterus, diastasis of the rectus muscles, cystocele, and rectocele. A woman's struggle to gain a livelihood or the worry incident to marital infelicity may result in nervous exhaustion or lead to the false

belief that a pathologic condition of the sexual or reproductive organs is present. Idleness, luxurious living, and indulgent habits lead to obesity, muscular weakness, digestive disturbances, and pelvic congestion, with its sequelæ. Such patients often exaggerate their symptoms and complain excessively, but make no effort at the self-denial which may be required in the treatment.

Menstrual History.—In this country puberty occurs on the average between the ages of twelve and fourteen. Early puberty is believed to be favored by hot climates, luxurious living, and sensual pursuits. Late puberty is said to be favored by cold climates, hard work, mental worry, and distress. From the investigations made by Englemann it would appear that the influence of climate is somewhat exaggerated. However that may be, in the United States puberty delayed beyond the age of fifteen is often indicative of a lowering of the general health. When the general signs of puberty appear and periodic attacks of pelvic pain without menstrual flow occur, some form of gynatresia may be suspected.

When taking the history of menstruation, the characteristics of the menstrual flow at the beginning and after it had become well established should be ascertained. Such data are quite important in order to determine the so-called "menstrual habit;" *i.e.*, the periodicity, duration, amount, and subjective sensations of menstruation which are the rule in the individual case. Later in life variations from this menstrual habit are often significant in the history, and may be indicative of acquired diseases. In the average menstruation occurs at intervals of from twenty-eight to thirty-one days, but certain women in perfect health menstruate every twenty-five days or even twenty-one days. The duration of the flow varies from two to nine days, the average being from five to six days. The amount of menstrual fluid lost varies between three and nine ounces, although for obvious reasons it is difficult to estimate the amount correctly.

Backache and discomfort in the lower abdomen are quite common during menstruation, although certain individuals may experience no disagreeable sensations whatever. When the suffering is severe or becomes so marked that the woman is incapacitated, dysmenorrhœa is said to be present.

In dysmenorrhœa the pain is usually in the lower abdomen or in the back, but severe headache or neuralgia occurring only at the menstrual epochs may constitute a form of dysmenorrhœa. One should determine whether there has been any variation from the menstrual habit, and if so, the time at which it occurred and whether it followed a change of climate, general illness, exhausting work, prolonged worry, a change in occupation, labor or miscarriage, etc. The date of the last menstruation should always be ascertained lest pregnancy be overlooked.

The menopause occurs on the average about the age of forty-five, but it may take place as early as thirty, or as late as fifty years.

Pregnancies.—The duration of married life and the period of time that elapsed after marriage when conception first occurred may serve to indicate the presence of healthy or imperfectly developed or diseased pelvic organs. The date of the last pregnancy and the length of time that has elapsed since should be ascertained and compared with the interval that occurred between

marriage and the first conception. If conception occurred soon after marriage and was followed by a prolonged period of sterility, a lesion acquired during or as the result of the initial pregnancy may be preventing conception. All these facts may be distinctly modified by the condition of the husband and by any measures that have been adopted for the prevention of conception. The examiner should ask whether previous pregnancies have been abnormal in any particular, and whether there were any complications, such as eclampsia or nephritic or hepatic toxæmia.

Labor.—The course and effects of labor have a very important bearing upon the possibility or probability of the existence of various lesions resulting from injury during childbirth. Thus it should be ascertained whether the labor was long or short, whether anæsthesia was employed, whether forceps or any surgical measure was necessary, whether postpartum hemorrhage occurred or any difficulty attended expulsion of the placenta, whether lacerations resulted, and whether sutures were introduced. Inquiries should also be made as to the probability of infection having taken place during labor or subinvolution and displacement having occurred afterward. For example, the patient should be asked if she had peritonitis, fever, milk-leg, or "blood poisoning" during the puerperium; on what day she left her bed, and the care she exercised as regards lifting or doing heavy work. The duration of lactation may have had some bearing on the subsequent menstrual history and on the general health. Protracted lactation may result in hyperinvolution of the uterus and anæmia.

Abortion.—The occurrence of a single abortion may have no particular significance, but repeated miscarriages are usually attributable to intent on the part of the patient or to the presence of a pelvic or general lesion that may be corrected. Every patient who has had an abortion has been subjected to the same possibility of infection, subinvolution, etc., that obtains in labor at term. If an abortion has occurred, inquiry should be made as to the month of pregnancy at which it took place, the probable cause thereof, what the symptoms were, how long they lasted, whether the patient secured the services of a physician, and whether instrumental evacuation of the uterus was necessary.

The history of a foreign body having been introduced into the uterus for the purpose of inducing abortion and the occurrence of fever, peritonitis, or of any symptom that might indicate subsequent infection point to the possibility of an existing inflammatory disease. Repeated abortions are usually indicative of syphilis, displacement of the uterus, or of wilful attempts to terminate gestation.

Family History.—The family history may have no bearing whatever upon the condition of the patient. Although few pelvic disorders are inherited, nevertheless some are secondary to extrapelvic lesions, as, for example, tuberculous salpingitis, the tendency to which, at least, may descend from parent to offspring. Although the disease usually appears only in males and is transmitted only by females, hemophilia in the uncle is said at times to explain persistent menorrhagia in the niece. Syphilitic parents may transmit the luetic taint to their offspring. A predisposition to diabetes, gout, rheumatism, neuralgia, migraine, mental or nervous disorders,

such as neurasthenia, hysteria, epilepsy, chorea, angioneurotic œdema, is often encountered in the children of parents so afflicted. While there is no proof here of the relation of cause and effect, it is interesting, at least, to note the occurrence of carcinoma or fibroid tumor in the female descendants of a victim of these disorders. The menstrual and reproductive history of the mother and sister may often be repeated in another member of the family who comes under observation.

General Previous History.—Previously occurring diseases may have some bearing on the present illness. One need but mention pulmonary tuberculosis as an antecedent to tuberculous salpingitis, syphilis as a factor in uterine hemorrhage, myalgia as a possible explanation of backache, chlorosis as a manifestation of hypodevelopment of the generative organs and the circulatory system, neurasthenia, psychasthenia, epilepsy, or chorea as indications of an unstable nervous system. Certain disorders of infancy and childhood may have affected the pelvic organs without producing symptoms at the time directing attention to them. The influence of early vulvovaginitis in the production of vaginal atresia, discovered later in life, should be kept in mind. That vulvovaginitis is commonly the result of gonorrhœal infection is well known, but it may be produced secondarily, as the result of pneumonia, scarlatina, diphtheria, measles, dysentery, and typhus fever. Infectious diseases occurring in infancy and childhood may affect secondarily the uterus, tubes, and ovaries. Gonorrhœal vulvovaginitis of infants rarely reaches the endometrium.¹ The endometrium has been found affected in patients dying of pneumonia, typhoid fever, and dysentery, and Penrose has made the statement that “acute inflammation of the endometrium sometimes occurs during the exanthemata.” It appears that any of the infectious fevers occurring during early life may affect the ovaries. Small-pox, scarlet fever, and parotitis are said to be especially prone to be complicated by parenchymatous changes in the ovaries, as, *e.g.*, cloudy swelling or degeneration of the follicular epithelium. Noble observed a case of parotitis followed by evidences of ovaritis and subsequent amenorrhœa for six or eight months. Involvement of the generative organs during the infectious fevers of early life is but rarely referred to in works on pediatrics. Nevertheless, the weight of evidence of careful observers is that these organs are often affected, but that the disturbance is of mild grade and soon disappears. Exceptionally the involvement is marked and the impairment may become permanent.

Beginning of the Present Disorder.—It is well to ascertain whether the symptoms of which the patient complains date from the time of puberty, marriage, labor, abortion, traumatism, or the menopause, or whether they can be referred to no especial cause or occasion.

Developmental anomalies first become manifest at the time of puberty or marriage; gonococcus infection dates from marriage or from a suspicious intercourse; gonorrhœal endometritis or peritonitis in a patient already in-

¹ Suppurative appendicitis in childhood has been said to interfere with the development of the genitalia and lead to infantilism, amenorrhœa, dysmenorrhœa, etc. It may undoubtedly be associated with pelvic inflammation and be followed with adhesions which close the tubes and lead to sterility in later life. Many cases of otherwise unexplained pelvic adhesions may be due to this cause.

fects frequently sets in about the time of a menstrual period; symptoms of uterine displacement, cervical laceration, and relaxation of the pelvic floor are referred usually to parturition.

Present Symptoms—Pain.—Pain in the external genitalia accompanies inflammatory and other diseases of the vulva. It may be referred to the vulva from the ureter and kidney. Pain in the bladder and urethra is a symptom of urinary lesions, as, for example, inflammatory conditions, such as cystitis, urethritis, calculus, new growths (papilloma, urethral caruncle), and vesicourethral fissure. Frequent and painful urination may be a symptom of any pelvic disorder that exerts traction or presses upon the bladder, or it may be due to a relaxation of the perineum that permits the base of the bladder to sag. The pain of an acute inflammatory urethritis or cystitis may be very severe and be accompanied by straining and tenesmus. In extravescical inflammatory or other lesions that compress or draw upon the bladder the pain is ordinarily less acute in type. The frequent urination and discomfort incident to relaxation of the pelvic floor are greatly relieved when the patient assumes the prone position or when the displaced organs are supported in their normal position by the aid of a pessary.

Pain during sexual intercourse is known as dyspareunia. A feeling of fulness and pressure or even of pain in the rectum may be caused by a rectocele. Difficulty in defecation may result from the fecal mass being driven toward the vaginal instead of toward the anal outlet. The patient is frequently unable to relieve herself until she pushes back the rectocele with her finger or liquefies the fæces by means of an enema. In extreme degrees of backward displacement of the uterus, when the body of the organ rests against the intestine, a sensation as of a foreign body in the rectum may be felt during defecation.

A pelvic hæmatocele or a pelvic inflammatory mass may be associated with an intense and urgent desire to defecate. Pain during defecation is sometimes present in prolapse of the ovary. Severe pain during and after defecation is usually due to anal fissure, hemorrhoids, or perirectal abscess.

Pain in the lower abdomen in the median line may be associated with relaxation of the pelvic floor, backward displacement of the uterus, uterine prolapse, and uterine or ovarian tumors filling the pelvis.

Pain at the sides of the lower abdomen is most often associated with pelvic inflammatory disease or tubal and ovarian affections, as, for example, tubal pregnancy, cystic or prolapsed ovary, and small ovarian cysts. Pain due to lesions of the appendix is felt on the right, of the sigmoid on the left, and of the small intestine, kidney, and ureters on both sides. Pain due to displacement of the uterus, chronic metritis, congestion of the pelvic veins, and constipation is generally present in the lower abdomen on the left side.

Pain in the sacral or lumbar region and in the buttocks or the back of the thighs may be associated with many gynecologic conditions or be due to lumbosacral or sacroiliac sprain. Backache of pelvic origin is especially characteristic of a relaxed pelvic floor and displacement of the uterus.

Pain in the thighs may be caused by pressure of a tumor on the sciatic,

obturator, or anterior crural nerves, or by inflammatory conditions within the pelvis.

The character of the pain varies. Dull pain is most common in uterine enlargement (subinvolution, fibroid tumor) or displacement (descensus, prolapse), and in relaxation of the pelvic floor, and it may also be the result of pressure. When due to displacement, such pain is often associated with a dragging sensation, and when due to relaxation, with a want of support. Sharp stabbing pain in the pelvis is usually indicative of peritoneal involvement, as, for example, in salpingitis, ovaritis, appendicitis, peritonitis; excruciating pain of this type is present in rupture of a pregnant tube, twisting of the pedicle of an ovarian cyst or a fibroid tumor, intestinal obstruction, etc.

Aching, neuralgic pain occurs in the areas of final distribution of those nerves which pass through the pelvis. This type of pain is common in the stage of carcinoma in which the cancer cells have actually invaded the nerve-sheaths. Dense inflammatory deposits in pelvic cellulitis and certain hard, fixed pelvic tumors produce similar symptoms, but they are usually of milder degree.

Colicky pain in the pelvis is generally due to an effort of the uterus to expel a foreign body—the menstrual fluid in cervical stenosis; a bit of placenta after labor or miscarriage; an endometrial polyp or a pedunculated fibroid tumor. Repeated contractions of the overdistended ectopic tube preceding tubal rupture or abortion may produce the most severe recurring pelvic cramps. Superficial burning and itching pains are accompaniments of acute inflammatory diseases of the vulva and vagina.

The time at which pain occurs is of considerable significance. The pain due to displacements and relaxation subsides when the patient reclines in bed, and increases in severity when she goes about or works.

Muscular or neuralgic pain is often worse at night or upon arising, and diminishes as movement limbers up the muscles and joints.

Inflammatory pain is relieved to a certain extent by rest, since the inflamed surfaces are kept apart and the muscular tension over the inflamed areas is reduced. Pain due to pelvic disease is almost invariably increased at the time of the menstrual periods.

The pain of lumbosacral or sacroiliac sprains is augmented by certain movements that cause a strain upon the joints involved, and is diminished by immobilization of the parts. These pains are not always relieved by rest in the recumbent posture. After the patient goes to bed certain attitudes must often be assumed and pillows and the like be arranged in a certain way before relief will be obtained.

Menstrual Symptoms.—The periodicity, duration, amount, and subjective symptoms should be ascertained.

Amenorrhœa may be an indication of occlusion of the genital tract, of imperfect development, of lesions in the ovary, and of certain constitutional conditions that affect the general health. Amenorrhœa is physiologic during pregnancy and lactation, and is also caused by psychic impressions and changes of climate. Scanty menstruation is closely allied with amenorrhœa. Suppression of the menstrual flow may follow exposure, wet feet, or

insufficient clothing of the lower extremities. Sea-baths, cold douches, and acute endometritis are also among the causes that produce amenorrhœa.

Menorrhagia and metrorrhagia are conditions that are more or less similar in origin. Any general state that predisposes to congestion of the pelvic blood-vessels, the acute infections, such as typhus or cholera, and secondary or tertiary syphilis are factors in the etiology. Among the local causes may be mentioned polyps, subinvolution, fibroid tumor, and carcinoma. Metrorrhagia is usually of more portentous significance than menorrhagia.

Dysmenorrhœa is a term which as usually applied signifies sharp, cramp-like pain in the lower abdomen, severe backache, and dull pain in the hips and ovarian region. Severe headache occurring only at the menstrual epoch has been considered by some a form of dysmenorrhœa, but this theory is probably incorrect. The part that menstruation plays in the production of periodic headache is possibly due to the increase of blood pressure and nervous unrest associated with the menstrual epoch. Headache has been ascribed to pelvic disorders, but these are rarely a primary cause.² More often they are a secondary factor, as witness the headache of intestinal stasis due to pelvic adhesions, the toxic headache that results from chronic pelvic infection, the anæmic headache associated with fibroid tumor, etc.

When dysmenorrhœa is a prominent feature the history should bring out the location and the character of the pain; whether it occurs before, coincident with, or after the flow, and how long it continues. Dysmenorrhœa may be symptomatic of almost any pelvic lesion, or it may be significant of imperfectly developed organs. It may also be purely nervous in type.

In obstructive dysmenorrhœa the pain is most severe before the flow appears. In chronic pelvic diseases other than uterine the pain is usually of a dull, heavy character, preceding the menstrual flow and gradually subsiding as the flow is established. Dysmenorrhœa associated with fibroid tumor or displacement of the uterus appears with the flow and continues throughout the period. The neuralgic form of dysmenorrhœa may simulate any of the other types.

Leucorrhœa.—The amount of the discharge may be judged by ascertaining whether a napkin must be worn to prevent soiling of the clothes. The consistency, color, and odor of the discharge may all be significant.

A thick, mucous discharge of an extremely tenacious character usually comes from the cervix. If the discharge is mucopurulent, the presence of the remains of an old infectious process may be suspected.

²The belief that physiologic and pathologic states of the female generative organs often produce headache is widespread. Text-books mention dysmenorrhœa, "uterine disease," and diseases of the ovaries and even of the bladder as causes of headache, but no justification for this belief has yet been attempted. Headache is, of course, exceedingly common during menstruation, but so it is in eclampsia, although no one to-day would connect the eclamptic headache in any direct way with the condition of the uterus. Toxemia of the puerperium and toxemia of the menstrual period constitute a much more possible though not a demonstrable hypothesis.

Under his Table II, Cabot lists 13 gynecologic conditions as the etiologic factors in headache. In only two, dysmenorrhœa and antelexion, were headache, backache, and other hysteric or neurasthenic symptoms present more often than they were absent. In 181 cases in which the pelvic organs were normal the headache, backache, etc., were present.

In retropositions, for instance, headache, backache, etc., were absent in 44 cases, and present in 36.

A purulent discharge is symptomatic of one of the acute inflammatory or ulcerative lesions of the genital tract. As the process subsides the discharge becomes mucopurulent in character.

Serous leucorrhœa or a thin watery discharge may accompany hyperplasia of the endometrium, and may occur early in the course of carcinoma of the body of the uterus, fibroid tumor, or sarcoma. A leucorrhœal discharge with a putrid odor is significant of necrosis, and may be caused by a broken-down carcinoma, sloughing, necrotic polyp or fibroid, and decomposing retained secundines.

Constipation.—Constipation is very common in women, and is especially marked in cases of retrodisplacement, fibroid tumor of the uterus, or impacted pelvic growths of any variety that encroach upon the rectum. It is also present in pelvic inflammatory diseases, both in the acute and in the chronic stage.

Urinary Symptoms.—Frequency of urination is a common symptom of pelvic disorders, either of the bladder itself or of the structures in relation with it. In most cases of displacement of the uterus, relaxation of the pelvic floor, pelvic tumors, and pelvic inflammatory disease, frequent or painful micturition is a common finding.

Frequent urination due to insufficiency of the pelvic floor is relieved by the recumbent posture. An inability completely to evacuate the bladder may exist in marked cases of cystocele, and in these cases the residual urine is often ammoniacal in nature.

Diseases of the bladder and urethra as a cause of these symptoms can be excluded only after urinalysis or cystoscopic and urethroscopic examination has been made.

Gastro-intestinal Symptoms.—A number of gastro-intestinal symptoms may be produced by adhesions between pelvic inflammatory masses and the intestines or omentum, and a large pelvic tumor encroaching upon the abdominal cavity may displace and compress the hollow viscera. Various degrees of ptosis also are associated at times with relaxation of the abdominal wall and displacement of the uterus. Not infrequently the appendix is involved coincident with pelvic inflammatory disease, and in patients over forty and fat, gall-stones may be present. The patient should invariably be questioned concerning any of the symptoms that might indicate the presence of the lesions mentioned. Anorexia, a coated tongue, and a fetid breath may be the evidences of gastric, hepatic, and intestinal torpidity. Distress after eating, epigastric pain, and nausea and vomiting are not infrequently the symptoms of gall-stones. Gastric and duodenal ulcers must also be kept in mind, although they are not so frequent in this country as are gall-stones.

Tympanites, cramp-like pain distributed more or less over the entire abdomen, obstinate constipation alternating with diarrhœa, impaired intestinal digestion, etc., may be indicative of ptosis, of adhesions of the intestines, or of chronic appendicitis.

The patient should be questioned regarding previous attacks of pain that may have simulated appendicitis, the symptoms of which are more or less familiar to the laity.

Respiratory Symptoms.—Dyspnoea is at times produced by the pressure of a large intra-abdominal tumor. It is common in the anæmic subjects of fibroid tumor, and in the excessively obese.

Circulatory Symptoms.—Palpitation of the heart may at times be associated with the anæmia and myocarditis incident to fibroid tumor, and with the pressure of large intra-abdominal tumors or collections of fluid. The pressure of an intrapelvic tumor may cause œdema of the ankles or of the entire lower extremities, or it may produce varicosities in the saphenous veins.

Nervous Manifestations.—Headache is a not uncommon symptom, and in many cases, especially in those suffering from nerve exhaustion, the distress is occipital and is accompanied by pain along the upper part of the spine. Headache is rarely due primarily to pelvic trouble, but may be caused indirectly by intestinal stasis or inflammatory diseases and their secondary toxæmias. The frequency with which a predisposition to headache is associated with neurasthenia and psychasthenia, or merely with nervous temperament, is significant of the close relationship that exists between this disorder and an unstable nervous organization. Diseases of the eye and of the nasofrontal sinuses, gastritis, etc., are certainly more frequent causes than the pelvic disturbance itself. Headache may be hereditary, as, *e.g.*, in migraine, or it may be due to syphilis or to brain tumor. Headache occurring chiefly at the menstrual periods is usually a manifestation of the increased vasomotor and nervous impulses present at that time.

Many patients who exhibit symptoms simulating those of pelvic disorders are neurasthenic or hysteric subjects. Vertigo and depression of spirits may accompany an asthenic general condition, and may be especially marked at the menstrual periods or at the time of the menopause. A woman may be subject to many nervous conditions that vary all the way from eccentricity to an actual neurosis. Eccentricity may be hereditary or due to the peculiarities of environment and the habits of the individual. Simple instability of the nervous system (nervousness) may be due to anxiety, prolonged and uncongenial work, distressing circumstances, sudden calamities, shock, and anything that will upset or unbalance the nervous equilibrium. Nervous symptoms are particularly marked at the menstrual periods.

Psychasthenia, an unbalancing of the mind, may be evidenced by instability of purpose, emotional outbreaks, depression of spirits, and fixed ideas of unworthiness, persecution, and marital infidelity. Mental depression is not uncommon at the menstrual periods. It is only by close questioning and possibly from the information secured from friends that the physician will be enabled to decide between the imaginary and the real in the patient's recital of drudgery, blighted affections, etc. It may at times be extremely difficult to ascertain the real cause of the depression and nervous exhaustion. Even the most intelligent will often, from a sense of shame, conceal the important causative factors of their nervous unrest and depression.

General Health.—The present condition should be compared with that of earlier years. The patient who has never been robust is more likely to be suffering from constitutional illness or defects than is the one whose indisposition dates from a certain epoch, such as puberty, marriage, labor, etc.

BIBLIOGRAPHY

- BUTLER, G. R.: *The Diagnostics of Internal Medicine*. Appleton, New York, 1911, 3d ed.
- CABOT, R. C.: *Differential Diagnosis*. Saunders, Phila., 1911.
- CHAPIN, H. D., AND PISEK, G. R.: *Diseases of Infants and Children*. Wood and Co., New York, 1911, 2nd ed.
- DERCUM, C. T.: "The Nervous Disorders in Women Simulating Pelvic Disease. An Analysis of 591 Cases." *Jour. Amer. Med. Asso.*, March 13, 1909, p. 848.
- HOLT, L. E.: *Diseases of Infancy and Childhood*. Appleton, New York, 1908, 4th ed.
- KELLY, H. A., AND HURDEN, E.: "Operations Before Puberty," Chap. xxv, *Kelly-Noble, Gynecology*, vol. i, Phila., Saunders, 1907.
- KERR, C. B.: *Infectious Diseases*. Oxford Med. Pub. Co., London, 1909.
- KISCH, E. H.: *Das Geschlechtsleben des Weibes*. Urban and Schwarzenburg, Vienna, 1907.
- LEBEDINSKY: "Über pathologisch-anatomische Veränderungen an dem Eierstocke bei Scharlach." *Centralbl. f. Gynäk.*, 1877, i, 110.
- MASSIN, W. N.: "Zur Frage über Endometritis bei akuter infectiöser allgemeiner Erkrankungen." *Arch. f. Gynäk.*, 1891, xi, 146.
- NOBLE, C. A.: "The Constitutional Factor in Gynecology." *Trans. Amer. Gyn. Soc.*, vol. xli, 1916, p. 656.
- OSLER, W.: *Principles and Practice of Medicine*. Appleton, New York, 1912, 8th ed.
- STENGEL, A., AND FOX, H.: *Text-Book on Pathology*. Saunders, Phila., 1915.
- TAIT, LAWSON: *Pathology and Treatment of Diseases of the Ovaries*. Cornish, Birmingham, 1883.
- THORN, WILHELM: "Beitrag zur Lehre von der Atrophia Uteri." *Zeitschr. f. Geburtsh. u. Gynäk.*, Bd. xvi, S. 57.
- VEIT, J.: *Handbuch der Gynäkologie*. Bergemann, Wiesbaden, 1897.

CHAPTER VII

GENERAL PHYSICAL EXAMINATION

THE diagnosis is based to a certain extent upon the results of physical examination. Much stress may be placed upon the importance of ascertaining the general physical and mental condition of the patient. Not infrequently the patient has undergone a thorough physical examination before she is seen by the gynecologist. When a careful general investigation has not previously been made, it should be conducted in conjunction with the gynecologic examination. The assistance of an internist, an alienist, or possibly a specialist in diseases of the eye, ear, nose, and throat may be required in order to interpret correctly the symptoms presented and indicate the proper treatment.

The gynecologist should note the general appearance of the patient—the build, whether emaciated, well rounded, or excessively fat; the carriage, whether erect or stooped; the color, whether it be the glow of health, the pallor of anæmia, or the yellowish tint of cachexia; the facial expression, whether it indicates buoyancy of spirits or mental anxiety and depression: the weazened face of the woman suffering from an ovarian cyst, or the perturbed, anxious expression of one stricken with peritonitis.

TEMPERATURE

An elevation of temperature accompanies most of the acute infections of the pelvic organs. It may also be present as the result of the absorption of ferments or toxins from blood-clots and traumatized or necrotic tissue. The height of the temperature and the variations in its course are dependent upon the nature of the underlying lesion and the resisting powers of the individual. The temperature in gonococcus and tuberculous infections is lower than in infections due to the streptococcus, staphylococcus, colon bacillus, bacillus pyocyaneus, bacillus diphtheriæ, and other pyogenic organisms. Infections of the lower genital tract, vulva, urethrovaginal glands, etc., are less likely to be accompanied by high fever than are those of the cervix, endometrium, uterine wall, cellular tissue, tube, ovary, and pelvic peritoneum. Rapidly growing or disintegrating malignant growths are accompanied with pyrexia. Necrotic decidua or retained placenta, sloughing cervical polypi, or submucous myomata usually give rise to fever. In tubal pregnancy, pelvic hæmatocele, ovarian cyst, or pedunculated fibroid tumor with twisted pedicle the temperature is, as a rule, slightly elevated from absorption of fibrin ferment, even though no infection has occurred.

The elevation of temperature accompanying pelvic disorders is usually continuous in type; but if the progress of the disease is arrested and there is a localized collection of pus, it becomes remittent. If very little or no pus is formed and the septic products of the infection are absorbed, the temperature gradually recedes to normal. In the acute pyelitis of pregnancy and in acute phlebitis or cellulitis following abortion or labor, the temperature is

remittent or intermittent in type from the beginning, and is accompanied by chills. Chills and high remittent fever are characteristic of the sudden entrance into the blood of large amounts of septic products, as in streptococcus infections of the uterine wall, the veins or lymphatics of the broad ligament, or the pelvic peritoneum.

The elevation of temperature accompanying pure gonorrhœal pelvic inflammatory disease, as a rule, subsides as the disorder disappears in the course of a week or ten days.

The temperature of streptococcus infections is more apt to continue for a longer period, and to be subject to repeated exacerbations, finally reaching the normal or becoming intermittent if an abscess forms.

CIRCULATION

Pulse.—The pulse-rate is normally a little higher in women than in men. In febrile conditions the frequency is increased from eight to ten beats for each degree of temperature above the normal. The degree of acceleration of the pulse in direct ratio to the rise in temperature is often an indication of the virulence of the toxic products that are being absorbed. Thus a pulse-rate relatively lower than the temperature is an indication of a milder toxin, whereas a relatively more rapid increase is an indication of a more virulent toxic process. The full, high-tension pulse marks the strong reactions; the weak, low-tension pulse indicates an inability to react; the former indicates the antagonism of the economy to the toxic products, whereas the latter points to an overwhelming of the economy by the toxic products. Coldness of the extremities with a rapid, low-tension pulse and high fever are indications of approaching dissolution from absorption of septic products.

Rapid pulse unaccompanied by fever is observed in conditions in which excruciating pain is present, as, for instance, in twisting of the pedicle of an ovarian cyst or a pedunculated fibroid or during the passing of a renal calculus. In these conditions the patient is often in a state of collapse, and the temperature may be subnormal.

An increased pulse-rate and a subnormal temperature are seen after acute hemorrhage, either external, as in miscarriage with profuse bleeding, or internal, as in a ruptured pregnant tube with free intraperitoneal hemorrhage. The pulse is always of low tension in cases of hemorrhage. The rapid pulse of hemorrhage is not accompanied by dyspnoea until an extreme degree is reached. The pulse may be increased as the result of repeated hemorrhages occurring over a long period of time, after which anæmia and myocardial changes finally supervene, as in fibroid tumor. The rate may also be increased by pressure on the diaphragm exerted by abdominal tumors or ascites.

An increase in pulse-rate may also occur in the general disorders accompanying pelvic disease, such as hyperthyroidism, intrinsic cardiac disease, etc.

A sudden increase of the pulse-rate followed by a rapid failure is observed in pulmonary embolism.

The *blood-pressure* becomes higher with age. It is increased by arteriosclerosis, cirrhosis of the liver, interstitial nephritis, obesity, etc., and is diminished by anæmia, hemorrhage, and septic toxæmia.

After prolonged surgical operations, and in those attended with much loss of blood, the blood-pressure is subnormal.

The significance of abnormalities in the blood-pressure and their bearing on prognosis in operations will be dealt with in Chapter XXXV.

Heart.—Cardiac insufficiency may be responsible for menorrhagia, metrorrhagia, leucorrhœa, and other symptoms of chronic pelvic congestion. The pelvic condition that appears most frequently to produce cardiac disorders is fibroid tumor of the uterus. Murmurs, dilatation and hypertrophy, and fatty infiltration may occur. These are all due largely to anæmia, and if the fibroid tumor is removed before permanent changes have taken place, the heart may again become normal. When the tumor is of long standing, a form of myocarditis results ending in brown atrophy. The heart may be displaced upward and to the left by distention of the abdomen, as in ascites and large ovarian cysts.

Epigastric pulsation of the abdominal aorta is a common cause of complaint in neurotic females and at the climacteric. Functional cardiac disturbances, manifested by palpitation, faintness, pallor, rapid breathing, etc., may be observed at puberty, at the recurring menstrual periods, during coitus, at the climacteric, etc. They are seen chiefly in those of unstable nervous temperament.

Engorgement of the veins of the lower extremities, when bilateral, is frequently due to some general disturbance of the circulatory system; when unilateral, it is due to obstruction of some or of all of the tributaries of the iliac veins on the affected side; this may take the form of thrombophlebitis, carcinomatous infiltration, or compression.

The effect of cardiac conditions on the prognosis of operations is described in Chapter XXXV.

RESPIRATION

Respiratory Rate.—An increase in the respiratory rate in febrile conditions is in direct proportion to the elevation of the temperature and the frequency of the pulse. It may, however, occur independently of either, or with a rapid pulse alone, in anæmia, myocardial affections, and compression or displacement of the lungs by enormous distentions of the abdomen, as from tumors or ascites. Disproportionate acceleration of the respiratory rate is suggestive of intrinsic pulmonary disease—*e.g.*, tuberculosis, emphysema, asthma. When such disease really exists, other indications of it, notably cough and expectoration, are generally present. Rapid, sighing respirations are observed in acute profuse hemorrhage when the loss of blood has been great and dissolution is impending. Severe septic toxæmias may greatly augment the respiratory rate in œdema of the lungs and cardiac dilatation. Metastasis of chorio-epithelioma of the pelvic organs to the lungs is accompanied by pain, increase of respiration, cough, and bloody expectoration. Pulmonary embolism is marked by sudden and exaggerated dyspnoea.

The normal type of respiration that is a combination of costal and abdominal motion is changed to the costal variety, or partly so, by conditions that produce large distentions of the abdomen, as tumors, ascites, tympanites, etc.

The bearing of pulmonary diseases on the prognosis of surgical operations is dealt with in Chapter XXXVI.

Lungs.—Chronic bronchitis, emphysema, or asthma with cough may be a contributing cause of descensus uteri or incontinence of urine. A tuberculous pulmonary lesion may be the initial focus of an inflammatory disease of the same type in the pelvis.

Among the pulmonary affections following operations may be mentioned bronchitis, pneumonia, pleurisy, and acute pulmonary oedema.

BLOOD

Blood Count.—A complete examination of the blood is always desirable, for two purposes: First, to determine whether any form of anæmia is present, the blood picture showing, to a certain extent, at least, the general strength and resistance of the patient; and, secondly, to ascertain whether there is evidence of any septic process, as may be indicated by an increase in the number of leucocytes.

Leucocytosis is usually present in pelvic inflammation. It is less marked on the whole, in gonorrhœal salpingitis (12,000–15,000) than in acute appendicitis (15,000–20,000). It is more marked in puerperal or post-abortal infection than in either (20,000–30,000).

The increase in the white blood-cells in infectious processes affects especially the polynuclear cells. A disproportionate increase of the polynuclear cells over the total leucocyte count occurs in suppurative and gangrenous conditions.

The percentage of polynuclear cells, as shown by a differential count, may be taken as an index of the severity of the infection, as well as of the resisting power of the individual. As leucocytosis is an indication of resistance on the part of the patient, a steady increase usually points to an increasing lesion with increasing resistance, whereas a decrease indicates a subsiding or a localizing disorder. It must not be forgotten, however, that the white blood count may be low notwithstanding the presence of a serious and widespread local lesion if the patient is in poor condition and the natural defenses of the body are weak.¹

The anæmias encountered in gynecologic cases are, in a large majority of instances, those known as secondary, and result from hemorrhage or toxæmia or from both. In acute secondary anæmia the red blood-cells and the hæmoglobin are reduced proportionately, whereas the white cells are relatively increased. In chronic secondary anæmia without toxæmia all the cells are proportionately reduced.

In secondary anæmia with toxæmia (hemorrhage plus infection) the red cells and the hæmoglobin are diminished, whereas the white cells are proportionately and absolutely increased. In that form of anæmia known as chlorosis, which is most frequent in young women and interferes with the establishment and course of menstruation, other changes in the blood occur. The hæmoglobin is disproportionately diminished, and the red blood-cells may exhibit abortive or degenerate and malformed types.

¹ The polynuclear cells represent the phagocytic powers, and they are therefore increased during the acute stage of an infectious process in proportion to its severity and to the resistance of the individual. When the acute process has been arrested a diminution in the relative proportion of polynuclear cells and an increase in the relative proportion of lymphocytes occur.

Blood Culture.—A diagnosis of bacteriæmia can be made with certainty only when the organisms in the blood are identified. As a rule, the clinical evidences of bacteriæmia are sufficient for all practical purposes, so that cultures need not be taken. As an aid to prognosis, or for the selection or preparation of an antagonistic serum or vaccine, the isolation of organisms from the blood may be extremely useful. The presence of the streptococcus in the blood renders the prognosis grave, and is an indication for the injection of antistreptococcic serum. These organisms should always be demonstrated in the blood before the administration of antistreptococcic serum is begun. The staphylococcus and the colon bacillus may also be recovered from the blood. Repeated positive findings are necessary in order that faults in the technic may be excluded. An antistaphylococcic serum and an anti-colon serum are now on the market. (See Chapter XXI.)

Wassermann Reaction.—This reaction or test for syphilis is dependent upon the formation, in the blood of an infected person, of a specific antibody. This antibody has the power of combining with the complement (guinea-pig serum) in the Bordet-Gengou hæmolytic system and rendering it inactive. This system consists of antigen (solution of syphilitic liver), complement (guinea-pig serum), and suspected serum in certain definite amounts. After incubation for a short time—usually one-half to one hour—sheep's blood-corpuscles and the hæmolytic amboceptor are added and the whole again incubated. If the complement has been fixed by the antibody complement-fixing substance during the first incubation, it cannot combine with the other elements during the second incubation and cause a solution of the corpuscles, or hæmolysis. A positive reaction is indicated by the absence of, or a slight degree of, hæmolysis. The reaction is not absolutely specific; thus it has been found positive in frambæsia, leprosy, and yaws. It is, however, the most reliable test at our command in making a diagnosis of a syphilitic infection.

Abderhalden Serum Test.—The Abderhalden serum test was said to be of value in making the diagnosis of pregnancy. The test depends upon the appearance in the blood of ferments whose function it is to destroy foreign cells or their products invading the circulation. These invading elements in pregnancy are known as the syncytial cells. Owing to the elaborate detail of the technic and the uncertainty of the result, the test was not adopted generally for practical purposes. In view of the diverse and conflicting results obtained by various observers, the value of the test is doubtful. A positive reaction is of little value, since it may be found in conditions other than pregnancy, notably in carcinoma. A negative finding in a woman suspected of being pregnant is of considerable importance, since it is an indication of a lack of the specific ferments which are normally formed for the purpose of destroying the syncytial cells.

Complement-fixation Test for Gonorrhœa.—This test depends upon the fixation of a complement by a specific antigen (gonococci), and a specific antibody (in the patient's serum), with a resulting inhibition of hæmolysis or positive reaction.

Schwartz and McNeil, whose work along this line has been most convincing, employed a polyvalent antigen (12 strains of gonococci). They

used both antishoop and antihuman hæmolytic sera, and followed the technic laid down in the well-known Wassermann test for syphilis and in Noguchi's modification of this test.

A positive reaction is rarely attained until the third or fourth week of the disease. The reaction persists for seven or eight weeks after the patient has recovered. If only the anterior urethra is involved no reaction may be elicited.

In adult women the test is seldom positive until the infection has reached the cervical canal. In little children with vulvovaginitis positive reactions occur early. This may be explained by the more delicate nature of the vulvar and vaginal mucosa and the increased absorption therefrom.

A positive reaction may be regarded as evidence of gonococcus infection, but a negative reaction does not necessarily exclude the disease (Kolmer).

The test is of especial value to the gynecologist, since it is often difficult to demonstrate the existence of chronic gonorrhœa in women by the discovery of the gonococcus in smears or by cultures.

Lespinasse and Wolff believe the test to be of value in clearing up the etiology of certain obscure lesions—whether, for example, a certain leucorrhœal discharge is gonorrhœal or non-gonorrhœal; in differentiating gonorrhœa of the tubes from other pelvic lesions; in explaining the occurrence of puerperal fever in cases where aseptic precautions have been observed.

Thomas and Ivy point out that in the acute stage of the disease, when the fixation test is negative, it is usually easy to demonstrate the presence of the gonococcus bacteriologically, whereas in the chronic stage, when bacteriologic methods often fail entirely, the fixation test shows a positive reaction. The two methods of examination are, therefore, in a sense complementary.

Method of Obtaining Blood for Serum Tests.—Blood for cultures and for Wassermann reactions, the Abderhalden test, and the complement-fixation test for gonorrhœa may be obtained by puncturing a vein. The skin over the median cephalic or basilic vein is painted with tincture of iodine. The vein is rendered prominent by the application of a moderately tight bandage about the upper arm. For blood cultures a glass syringe of 10 c.c. capacity, to which is fitted a sharp-pointed needle, is used. The needle is passed obliquely into the vein, and the blood obtained by slowly withdrawing the piston. The bandage should be removed before the needle is withdrawn. The blood is immediately injected into bouillon or agar-agar. Extreme care should be taken to prevent contamination, and all the instruments and utensils must be absolutely sterile. For the complement-fixation and other tests the blood may be allowed to drop directly from the needle into a sterile test-tube; from 5 to 10 c.c. are required. The site of the puncture may be sealed with cotton and collodion.

URINE

Urinalysis.—A study of the urinary excretion discloses the condition of the kidneys. As the term is commonly employed, urinalysis comprises a chemical and microscopic examination of the urine. A complete investigation of the urinary function goes further and includes the determination of the total amount of urine excreted in twenty-four hours, and the ability of

the kidneys to excrete certain substances that test their functional activity. In order to differentiate between the functional activity of the right and of the left kidney it is necessary to employ cystoscopy and catheterization of the ureters, which are dealt with in Chapter IX. We will confine ourselves here to a general survey of a study of the urine, such as is required in the diagnosis and treatment of diseases of the generative organs.

A most important point to be emphasized at the beginning, and one that is frequently overlooked, is the fact that the discovery of certain abnormal constituents in the urine has no diagnostic value unless the specimen has been removed directly from the bladder with the aid of a catheter. If, for example, a voided specimen is found to contain albumin, pus, or blood, this is no indication that the bladder or upper urinary tract is the seat of disease, for the chemical or microscopic findings may be due to contamination with blood or pus escaping from the vaginal orifice. Unless the examination of a voided specimen is entirely negative, the result has no value. If, therefore, the voided specimen contains any abnormal constituents—and in a majority of patients coming under a physician's care this will be the case unless the vagina and vulva have been douched with sterile water just before the bladder is emptied—a catheterized specimen will be required in order to make accurate deductions.

The reaction of the urine is usually faintly acid. Alkalinity of a freshly obtained specimen indicates urinary stagnation and ammoniacal decomposition or the undue ingestion of alkalies.

A low specific gravity may be indicative of an abnormally large inhibition of fluids or of a faulty eliminative power of the kidneys.

A high specific gravity may indicate an excess of solids and a deficiency of fluids and of certain abnormal constituents, notably sugar.

The urine may give off an ammoniacal odor as the result of stagnation and decomposition, as in cases of large cystocele. An offensive odor, not unlike that of decomposing fish, is present in chronic infections of the urinary tract associated with bacteriuria. When there is a fistulous communication between the intestinal and urinary tracts the urine takes on a fecal odor. The urinary fluid may be cloudy from an excess of phosphates, urates, or oxalates. It may be pink or reddish in color from the presence of urates, uric acid, or blood, yellow from contamination with bile-pigment; black from the presence of old blood, and milky from admixture with pus.

It may contain macroscopic shreds of pus, long, worm-like clots of blood indicative of renal or ureteral bleeding, or the finely granular, brick-dust sediment of uric acid.

Albuminuria may point to interstitial or parenchymatous nephritis, pyelitis, ureteritis, or cystitis.

Pus in the urine may be found in any of the diseases associated with suppuration of the kidney, ureter, or bladder; if the specimen has not been obtained by catheterization, but was voided, diseases associated with suppuration of the urethra, ovaries, tubes, uterus, vagina, and vulva may be included in the summary of possible explanatory lesions.

Blood may be found in the urine in any disease of the urinary tract accompanied by trauma to the mucosa, fracture of friable masses, or destruc-

tion of tissue. Among the most frequent of these conditions should be mentioned calculus, tuberculosis, and new growths of the kidney or bladder.

Casts represent the albuminous products that have coagulated in the tubules of the kidney and were later expelled in the form of small cylinders.

Hyaline casts in the urine are an indication of altered excretion and of the presence of albuminous products.

Granular casts, blood casts or pus casts in the urine signify respectively the presence in the kidney of some process that causes destruction of the epithelium of the kidney tubules, a kidney disorder associated with hemorrhage into the tubules, or a suppurative disease of the kidney.

The urine as it is excreted from the kidney tubules may contain albumin, or the albumin may be derived later from the pus or blood that is mixed with it. Goldberg found that from 80,000 to 100,000 pus-cells per cubic centimeter of urine will produce 1 per cent. albumin.

Albuminuria may be due to pressure on the renal veins, as from the pregnant uterus or from a tumor. It may also be due to fever and to the absorption of toxins in infectious diseases. It may likewise be caused by an excess of proteids in the diet, prolonged physical exercise, and alcoholic excesses.

Glycosuria is usually indicative of diabetes, and may explain a persistent pruritus vulvæ. Temporary glycosuria may be observed as a consequence of the increased consumption of sweets.

Acetone may be found in the urine of patients suffering from the pernicious vomiting of pregnancy, ectopic gestation, continued fever, and acidosis. It is significant of acid intoxication. Diacetic acid may be found in the urine of patients suffering from diabetes and acidosis. Its presence also is indicative of acid intoxication.

Indican may be found in the urine of patients exhibiting conditions of diminished or inhibited peristalsis, constipation, peritonitis, or ptosis. It signifies that intestinal decomposition and putrefaction have occurred.

In addition to these chemical and microscopic tests the sufficiency of the kidneys is indicated in a general way by the total amount of urine excreted in twenty-four hours. This normally averages from 1200 to 1600 c.c. (40 to 60 ounces). It is increased by cold, when perspiration is diminished, and decreased by heat, when perspiration is excessive.

When more detailed information concerning the kidney function is desired, the tests described in Chapter IX should be undertaken.

Bacteriologic Examination of the Urine in General.—The specimen of urine to be examined may be centrifugalized and a drop of the sediment placed on a slide together with a drop or two of Gruebler's methylene-blue solution. This will demonstrate the presence of pus, blood, and epithelium, as well as of bacteria. Smears may also be made from the sediment, and allowed to dry; they are fixed and stained with methylene-blue or gentian violet for the ordinary bacteria, and by Gabbett's method for acid-fast bacilli. It is impossible to distinguish absolutely between the tubercle bacillus and other acid-fast bacilli. A point in the differentiation, however, is the fact that the tubercle bacilli are found at the periphery of clumps of degenerated

into a field of pus-cells. For positive identification the guinea-pig test should be made. Cultures may be made of the urine taken from the bladder or kidney by urethral or ureteral catheterization. The urine must be collected in sterile test-tubes which are then plugged with sterile corks and covered with rubber caps. The urine is transferred to the appropriate culture-medium by the bacteriologist.

Recognition of Tubercle Bacillus by Guinea-pig Inoculation.—The method of Bloch is the most rapid and satisfactory. A twenty-four hour specimen of urine is collected in a large sterile bottle. No preservative is added. The specimen is centrifugalized for from two to four hours; about 10 c.c. of the lower portion is taken. This sediment is shaken with 5 c.c. of sterile water, to make a suspension. Two healthy, normal guinea-pigs are inoculated. The inguinal glands of the animals are slightly injured by pressing and rolling them between the forefinger and thumb for a few moments prior to making the inoculation. About 2.5 c.c. of the prepared suspension is injected unheated into each animal subcutaneously in the inguinal region, below the glands. The glands are then again subjected to pressure for a few minutes, and this is repeated on the two succeeding days. At the end of ten days one of the animals is chloroformed, and the inguinal glands on the injected side are removed and sectioned and stained for the tubercle bacillus; or the glands may be finely macerated, pressed between two slides, and fixed and stained. In a majority of positive cases the tubercle bacillus is immediately discovered; if it is not, every part of the inguinal tissue is stained and subjected to examination. The other animal is kept for six weeks and is then examined for general tuberculosis.

BIBLIOGRAPHY

- BLOCH, A.: "Der rascher Nachweis des Tuberkelbacillus im Urin durch den Tierversuch." Berl. klin. Wchnschr., 1907, vol. xlv, p. 511.
- BUTLER, G. R.: *The Diagnostics of Internal Medicine*, 3rd ed. Appleton, New York, 1910.
- DERCUM, C. T.: "The Nervous Disorders in Women Simulating Pelvic Disease." J. A. M. A., vol. lli, p. 848.
- GIBSON, C. L.: "The Value of the Differential Leucocyte Count in Acute Surgical Disease." Ann. Surg., 1906, vol. xliii, p. 485.
- KEENE, F. E., AND LAIRD, J. L.: "The Diagnosis of Tuberculosis of the Kidney." Am. Jour. Med. Sc., 1913, vol. cxlvi, p. 352.
- KOLMER, J. A.: *Infection, Immunity and Specific Therapy*. Saunders, Phila., 1915, p. 483.
- LESPINASSE, V. D., AND WOLFF, M.: "The Clinical Value of the Gonorrhea Complement-Fixation Test," Ill. Med. Jour., 1913, vol. xxiii, p. 26.
- MUSSER, J. H.: *Medical Diagnosis*. Lea and Febiger, Phila., 1913.
- OWEN, R. T., AND SNURE, H.: "The Complement-Fixation Test in the Diagnosis of Gonorrhœa." Jour. Mich. State Med. Soc., 1913, vol. xii, p. 247.
- SCHWARTZ, HANS J., AND McNEIL, A.: "The Complement-Fixation Test in the Diagnosis of Gonococcic Infections." Am. J. Med. Sci., 1911, vol. cxli, p. 693; *Ibid.*: "Further Experiences with the Complement-Fixation Test in the Diagnosis of Gonococcus Infection of the Genito-Urinary Tract in the Male and Female." Am. J. Med. Sci., 1912, vol. cxliv, p. 815.
- SIMON, C. E.: *Clinical Diagnosis*. Lea and Febiger, Phila., 1911, 7th ed., p. 46.
- STENGEL, A., AND FOX, H.: *Text-Book of Pathology*. Saunders, Phila., 1915.
- THOMAS, B. A., AND IVY, R. H.: "The Gonococcus Complement-Fixation Test and Analysis of Results from Its Use." Arch. Int. Med., 1914, vol. xiii, p. 143.
- WARDEN, C. C., AND SCHMIDT, L. E.: "Gonococcus Complement-Fixation; a New Lipoid Antigen," Jour. of Lab. and Clin. Med. 1916, vol. i, p. 333.
- WINTER, G., AND RUGE, C.: *Gynecological Diagnosis*, edited by J. G. Clark. Lippincott, Phila., 1912.

CHAPTER VIII

EXAMINATION OF THE PELVIS AND ABDOMEN

IN making *the local physical examination* both the pelvis and the abdomen should be included. The most satisfactory results are obtained with the patient in a conscious state.

Examination Under Anæsthesia.—When, because of rigid abdominal walls, excessive adiposity, sensitiveness, or fear, a pelvic examination cannot be satisfactorily conducted, complete anæsthesia is advisable in order to

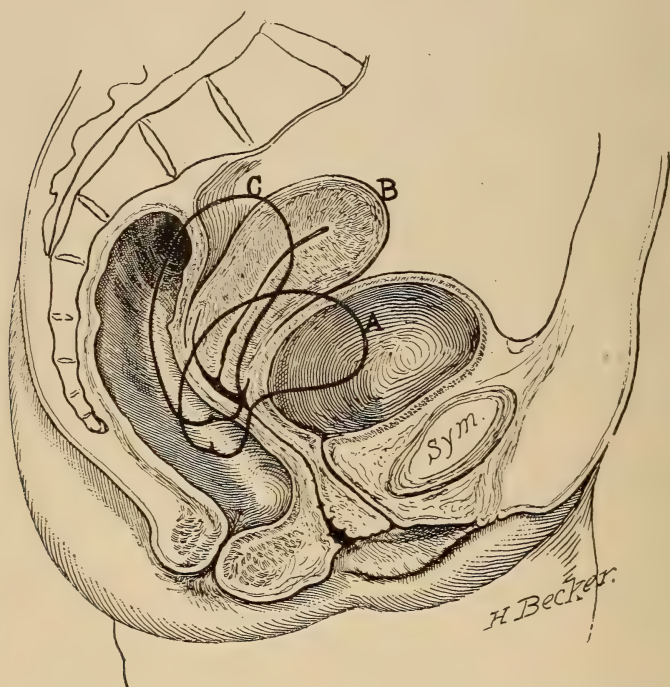


FIG. 99.—Diagram showing different positions of uterus with full bladder or rectum or both. Illustrates importance of having these organs empty at time of pelvic examination. (A) normal position of uterus; (B) position with bladder and rectum filled; (C) position of uterus with bladder alone distended.

rule out or to confirm the existence of a suspected lesion. As a rule, it is desirable, prior to examination, to obtain the permission of the patient to make such operative correction as the existing conditions may demand.

Examination under anæsthesia is most frequently required in young virginal women. In any case in which an abnormality is suspected and a bimanual rectal examination is unsatisfactory, examination under anæsthesia should be advised without delay. In young virginal women vaginal examination, except under anæsthesia, should be avoided. Every condition requiring operative correction should receive attention at this time, so that nothing

further will be required later. (See Relation of Neuroses to Pelvic Disease, Chapter XXXIV.)

Ether is the safest and most satisfactory anæsthetic to use for purposes of examination. Nitrous oxide does not give complete relaxation. If the patient is tuberculous or if the kidneys are seriously damaged, chloroform is to be preferred.

Preparation for Examination.—As a rule, some preparation for examination is required. Most patients who have leucorrhœa will take a vaginal douche before consulting a gynecologist. This often destroys important evidence, and it may be necessary to direct the patient to omit douches for several days and then return. The urine should be held as long as possible before the examination, so that the physician can ascertain whether or not Skene's tubules or the urethra contain pus.

The bladder and the bowel should be emptied before bimanual examination (Figs. 99 and 100). This may be impracticable at the first consultation, for an evacuation of the bowel may involve considerable delay. For that reason, if possible, the patient may be instructed to take a purgative the night before and an enema on the morning of the examination.

When a patient appears for examination and is insufficiently prepared, a second visit, with suitable preparation, should be ordered.

To facilitate a gynecologic examination a number of positions have been used that render the parts more readily accessible to inspection and simplify certain manœuvres that would otherwise be difficult.

The Dorsal Position (Fig. 101).—The dorsal position is the one commonly employed in bimanual palpation of the pelvic organs, inspection of the external genitalia, and local applications to the urethra, vulva, vagina, and cervix.

The patient lies upon her back with the thighs well flexed upon the abdomen and the knees widely separated. The legs are flexed on the thighs and the feet are held either by stirrups suspended from upright rods or by foot-rests at the end of the examining table. A portable stirrup or leg-holder has been devised by Robb, which facilitates examinations or operations in the dorsal position, and is especially adapted to procedures at home. The buttocks should project slightly over the edge of the table. If necessary, the patient can be examined in bed. She should lie across it with her buttocks resting on the edge, the shoulders and head elevated by a pillow, the knees widely separated, drawn upward, and supported by assistants.

When the feet are held in stirrups, they should not be widely separated. There will then be more separation of the knees than if the feet were held widely apart; the thighs will rotate outward, and the fullest relaxation of the lower abdominal wall will thus be secured.

The dorsal position is modified at times for the purpose of making

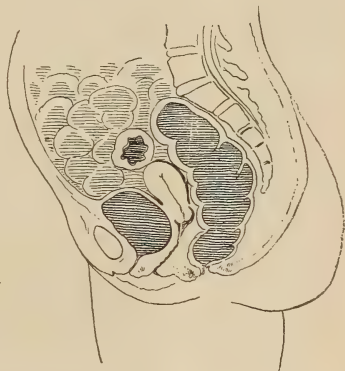


FIG. 100.—Position of uterus, with distended bladder and rectum.

bimanual palpation by slightly elevating the trunk; the examining table may be inclined somewhat toward the foot, or, if an examining chair is used, the patient is placed in a semi-sitting position. The dorsal position is that commonly used in performing plastic operations upon the cervix and the perineum.

Knee-chest Position (Fig. 102).—In assuming this position the patient is ordered to kneel upon the table, spreading the arms out on each side and



FIG. 101.—Dorsal or lithotomy position.

flexing the elbows. The face should be turned to one side. The thighs must be vertical, the chest must rest upon the table, the spinal column must be relaxed, and the lumbar curve be exaggerated.

The knee-chest position is useful principally in the treatment of retroversion and prolapse of the uterus, and for inspecting the bladder and rectum after atmospheric distention.

When the woman assumes the knee-chest position it is usually necessary, except in the case of multiparæ, to retract the posterior vaginal wall. Unless the uterus and base of the broad ligaments are fixed by inflammation

that the front of the chest lies in contact with the table. The thighs are flexed at right angles to the abdomen, and the legs at right angles to the thighs; the right thigh is flexed more than the left, so that the right knee lies above the left. A small, firm pillow placed beneath the hips will, by securing greater inclination of the pelvis, increase the efficiency of the position. This position is especially desirable for making an inspection of the anterior vaginal wall. It may also be used in place of the knee-chest position for making cystoscopic or proctoscopic examinations.

In treating a patient for retroversion or prolapse of the uterus it is often a good plan to have her acquire the habit of falling asleep in the Sims' position, reversing it at will, and lying alternately on the right and on the left side.

Supine Position (Fig. 104).—This is the position of choice in performing palpation of the abdominal viscera. The patient lies flat upon the back with some elevation of the shoulders and head. The thighs are slightly flexed upon the abdomen; the knees are bent and supported by a



FIG. 106.—Sims' speculum.

pillow beneath them, or by resting the feet upon a chair placed at the end of the table.

The **erect position** is employed in inspecting the contour of the abdominal wall in cases of fat and overhanging abdomen, relaxed and protuberant abdomen, visceroptosis, etc. The erect position is also valuable in determining faulty and improper habits of dress and of carriage which produce abnormal postures.

Preparation of the Hands.—The examining hand should be protected by a rubber glove. In making palpation of the rectum great care should be observed to prevent carrying infection from the vagina to the rectum. For this reason, in passing from one region to the other the glove should be changed or thoroughly washed and immersed in an antiseptic solution.

Lubricant.—Some form of lubricant is usually required, but should never be used when smears are to be taken from the urethra, Bartholin's glands, or the cervix. Glycerin is a very good lubricant; petroleum jelly and oil are quite commonly used. The most satisfactory lubricant is a vegetable jelly made up of gum tragacanth, 6 drams (25 gm.); phenol, $\frac{1}{2}$ dram

(2 gm.); glycerin, $1\frac{1}{2}$ ounces (50 c.c.), and water enough to make two pints (1000 c.c.). The lubricant should either be poured upon the fingers or expressed from a collapsible tube.

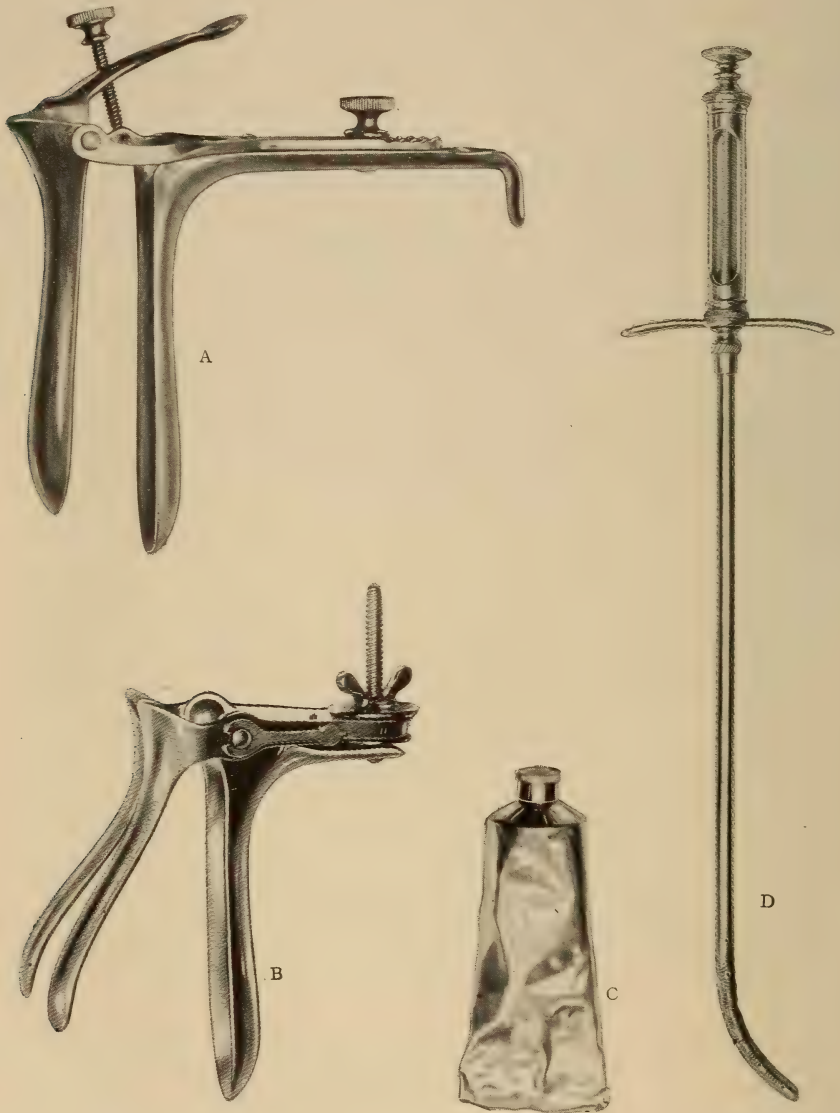


FIG. 107.—(A), Bivalve speculum. (B), Trivalve speculum. (C), Collapsible tube of lubricant. (D), Ultzmann syringe with roughened and perforated tip which may be wrapped with cotton for intrauterine injections.

Illumination.—In making an examination it is very essential to have a good light. The examining table should be placed preferably before a window, but if this is not at hand, a strong light that can be reflected at will should be provided. For this purpose a portable electric lamp or an electric lamp and a head-mirror may be employed.

Instruments.—A number of specula are required; at least one Sims' (Fig. 106), a bivalve and a trivalve speculum (Fig. 107), and a large-sized Kelly cystoscope to be used as a vaginal speculum in virginal women (Fig. 108). The speculum should be well lubricated before it is introduced. It is generally well to determine the position of the cervix by simple digital examination previously, and then to introduce the instrument toward that point with its blades in the oblique axis of the vagina.

The bivalve and the trivalve specula may be used with the patient in the dorsal position, since they hold the vaginal walls well apart for inspection. By gently rotating the instrument the entire vaginal wall may be brought into view.

The Sims' speculum is used with the knee-chest or the Sims' position, or with the dorsal position when assistants are at hand; both the anterior and the posterior walls may be retracted by separate specula.

Double Tenaculum.—A double tenaculum is often of great assistance in bringing the uterus within reach of the finger in the rectum, and for the purpose of assisting in making bimanual replacement of the uterus.



FIG. 108.—Kelly's urethral speculum, useful in examining virgins.

SPECIAL METHODS OF EXAMINATION

Exploration of the Uterus with a Sound.—The uterine sound (Fig. 110) should not be inserted during an office examination unless the vagina has



FIG. 109.—Double tenaculum

been thoroughly disinfected. In rare instances it may be used for the purpose of determining the exact position and depth of the uterine cavity.

Intrauterine Digital Palpation.—Digital palpation of the interior of the uterus is impracticable *unless the organ is or has recently been pregnant*. An exception to this rule may be found in the case of submucous myomata or

cervical or endometrial polypi that are being extruded through a softened and dilated cervix.

Dilatation of the cervix sufficient to permit the introduction of the finger may be made with the graduated metal dilators of Hegar or the branched dilators of Goodell (Fig. 111). In most cases preparatory softening and dila-



FIG. 110.—Long thumb forceps, uterine sound, applicator, spatula, curved dressing forceps.



FIG. 111.—Goodell's dilator.

tation are necessary and desirable. The introduction into the lower uterine segment, cervical canal, and vaginal vault of sterile gauze will usually effect sufficient softening and dilatation of the cervix within twenty-four hours to permit digital examination at once or after the use of moderate instrumental dilatation. If the size of the introitus will permit, the entire hand may be well lubricated and introduced into the vagina. Digital

exploration should always precede the use of the blunt curette or the placental forceps, and repeated explorations with the finger should be made during the removal of placental tissue. The finger alone can determine accurately the site of the retained portions and ascertain whether the uterus has been completely evacuated.

Diagnostic Curettement and Test Excision.—Curettement of the uterus for diagnostic purposes is of value for two reasons: First, the curette will reveal any unevenness or distortion of the uterine cavity to the trained hand; and secondly, the scrapings obtained may be subjected to microscopic examination (Figs. 112 and 113).

In obtaining scrapings for microscopic examination the surgeon should be certain that every portion of the uterine interior has been reached by the curette, and that all the scrapings have been sent to the pathologist. (See *Technic of Curettage*, Chapter XII.) The endometrial fragments or shreds should be received in sterile salt solution, in which the blood-clot should be separated from the curettings; the latter should then be placed in



FIG. 112.—Sims' curette.

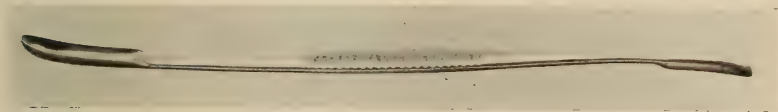


FIG. 113.—Martin's curette.

a 4 per cent. solution of formalin or in Zenker's fluid to fix and harden. Sections for histologic examination should be made from every part of the curettings.

The differentiation between benign and malignant affections of the endometrium and cervix is possible in many instances only as the result of histologic examination. At this point a word may be said upon the advisability of having the examination made by a pathologist who is thoroughly familiar with the appearance of the tissues in benign and malignant affections of the pelvic organs. A reliable general pathologist or microscopist may often be led into serious error or uncertainty because of an unfamiliarity with the benign changes in structure that the cervical or intrauterine mucosa may undergo.

Test excision of a piece of the cervix (Fig. 114) as a means of making a diagnosis is of great value, particularly in confirming or disproving a suspicion of malignancy. The excision may be made under local anæsthesia, but, as a rule, mild general narcosis is preferable. Careful asepsis must be observed. The excised portion must include the entire extent of the suspicious area; it should be immediately placed in 4 per cent. formalin solution or Zenker's fluid for hardening and fixing. Catgut sutures should be at hand to coapt the cut surfaces.

The gross examination of scrapings from the uterine interior and the macroscopic inspection of cervical lesions will often yield reliable information as to the nature of the disorder. Thus to the trained eye the villous appearance of fresh placental tissue from early embryos, the smooth, velvety thickening of the mucosa that has been transformed into decidua, the tough,

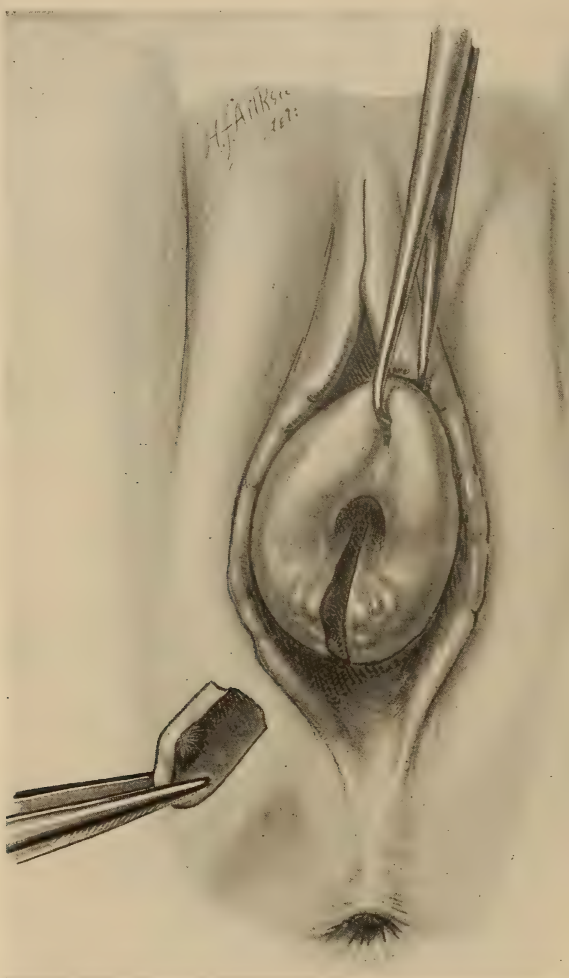


FIG. 114.—Excision of diseased cervical tissue for microscopic examination.

lumpy pieces of retained placenta, the friable fragments of carcinomata or sarcomata, and the scanty, thin shreds of atrophic endometrium, are all more or less easily recognized and characteristic. Of course, no one will rely upon this test alone, and histologic examination should always be made to confirm or disprove the diagnosis. Malignant affections of the cervix may almost invariably be recognized as such if the patient is anæsthetized and the suspected area is curetted. In the case of carcinoma or sarcoma the tissue is friable and brittle and easily detached from the surrounding healthy

tissue, leaving a depression that may be small in early cases and large in later ones. Here, too, the gross evidence must not be regarded as conclusive, and histologic specimens must be prepared. It is only by microscopic examination that the very early carcinomata of both the endometrium and the cervix can be detected. (See Carcinoma of the Uterus, Chapter XVIII.)

Smear Preparations as an Aid to Diagnosis.—In making a diagnosis of gonorrhœa it will usually be necessary to examine smears from the urethra, the glands of Bartholin, or the cervix. When the making of these smears is anticipated, the patient should be directed to omit douching and to hold the urine for some time previous to the consultation. No lubricant should be used on the examining finger.



FIG. 115.—Inspection of the external genitalia and expression of discharge from urethra.

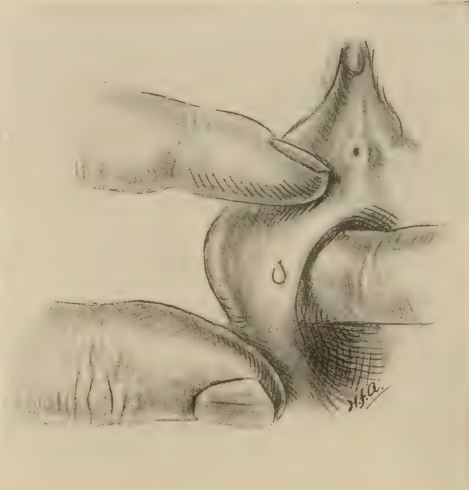


FIG. 116.—Inspection of the external genitalia, and expression of discharge from Bartholin's glands.

After exposing the vulva any secretion upon the external surface should be lightly wiped away with a pledget of cotton. The urethra, Skene's tubules, and Bartholin's gland on each side should then in turn be emptied (Figs. 115 and 116), and the discharge gathered up on a probe or a platinum loop and transferred to a glass slide.

After the external genitalia have been carefully cleansed and disinfected, the cervix may be exposed by means of a bivalve or a trivalve speculum. The discharge covering the vaginal cervix and portio should be removed, and an applicator wound with cotton should be passed into the cervical canal, moved about in all directions, and then rubbed upon a glass slide.

It is useless, as a rule, to search for the gonococcus in a discharge that is found in the vagina or upon the vulvar surface, since so many other bacteria are present, and this association with other organisms causes the gonococcus to lose its identity. An exception to this rule must be noted in infants affected with vulvar or vaginal gonorrhœa of the florid type.

After the smears have been made they should be permitted to dry and should then be fixed by passing them through the flame of a Bunsen burner three times, each passage being sufficiently slow to allow the glass to heat to a degree that is just unbearable to the touch. The smeared surface may next be covered with a saturated watery solution of methylene-blue or gentian violet, and allowed to stand for two or three minutes. The smear is washed in water, permitted to dry, and then examined under an oil-immersion lens (Fig. 117).

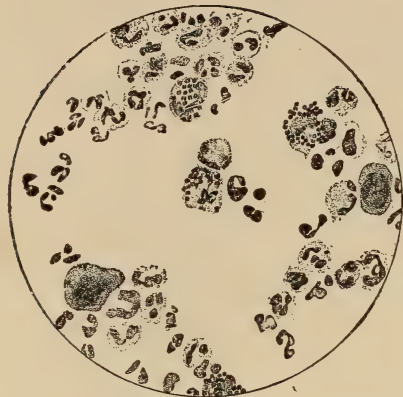


FIG. 117.—Gonococci stained in smear.
(Wilson.)

lately positive method of identifying the gonococcus under these circumstances is by means of cultures. These should be made only by an experienced bacteriologist. The search for the gonococcus in smears from the cervix is most likely to prove successful if the smears are taken just before or just after the menstrual periods. Old urethral infections may be brought to light by alcoholic excesses, especially the drinking of beer. The examination of smears should repeatedly prove negative before the patient is dismissed from medical attention.

Demonstration of *Treponema* (*Spirochæta*) *Pallidum*.—

The organism of syphilis may be found in smears from primary and secondary syphilitic sores. In suspected cases the test should be made from any suspicious ulcerated areas. A drop of the serum or exudate should be mixed with a drop of India ink. Microscopic examination can be made immediately with a high-power lens, or later with an oil-immersion lens, if the mixture is spread out in a thin film and allowed to dry (Fig. 118). The spirochæta may be detected in the serous transudate obtained by lightly curetting the edge of the lesion if stained with India ink or Goldhorn's or Giemsa's stains. The organism may also be recognized in the fresh unstained secretion from primary lesions and mucous patches with the aid of microscope and dark-field illumination.

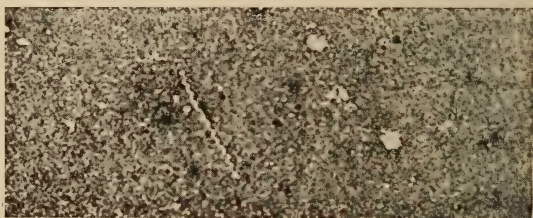


FIG. 118.—*Spirochæta pallida*. Smear made from chancre stained by india-ink method. (Hiss and Zinsser's Text Book of Bacteriology, D. Appleton & Co.)

Pelvic Examination.—Inspection of the external genitalia should be the first step in a pelvic examination. By it the existence of leucorrhœal discharge and the presence of venereal sores or of any other lesions of the vulva may be detected. Inspection will at once yield certain valuable information. For example, a virginal introitus will exclude the diseases due to pregnancy and childbirth; a reddening of the orifices of Skene's tubules and of the ducts of the vulvovaginal glands will suggest gonorrhœal infection; an imperforate hymen will explain the absence of the menstrual flow; extensive lacerations of the perineum, cystocele, rectocele, etc., are often revealed at a glance.

The cervix and the vaginal fornices are next exposed by means of a speculum (Fig. 119). The state of the vaginal mucosa, whether bathed in leucorrhœal discharge or bereft of its natural moisture, and the presence of erosions or of inflammation are at once apparent. The contour of the cervix, the amount and the character of the cervical discharge, and the presence of gross lesions may be detected. Aside from the question of cervical diseases, inspection of the cervix gives evidence of previous labor or abortion.

Palpation.—Evidence of the presence of a gonorrhœal infection may be obtained by "milking" Skene's tubules and the vulvovaginal glands. The friability and induration of a carcinomatous growth, the peculiar disk-like hardness of a chancre, the fluctuation of a vulvovaginal cyst, or the tenderness and induration of an inflammatory affection may be noted. The condition of the perineal floor may be ascertained, the presence of cystocele and

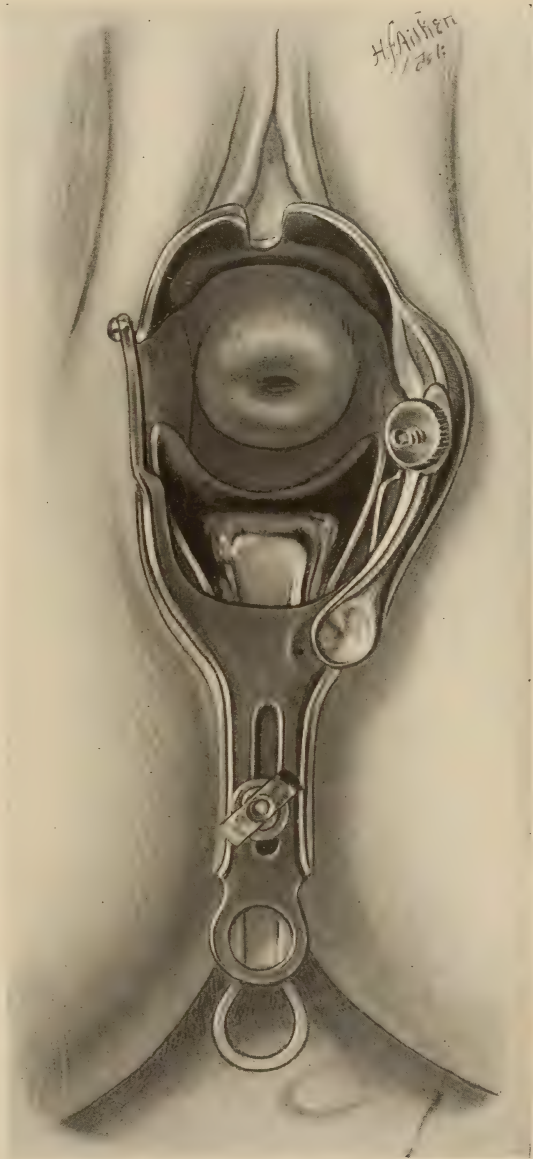


FIG 119.—Exposure of vagina and cervix by bivalve speculum.

rectocele, and the spastic contraction encountered in cases of vaginismus may be detected. The friability of a cervical growth, softening or induration of the cervix, or an increase in the patency of the cervical canal—all may be quickly ascertained.

Palpation of the vaginal vault yields additional information. In front of the cervix the sharp kink of an antelexion may be recognized; in well-



FIG. 120.—Touch picture. Simple digital examination and schematic outline of antelexion. The index finger feels the small conical cervix directed forward: the body of the uterus can be felt through the anterior vaginal wall.

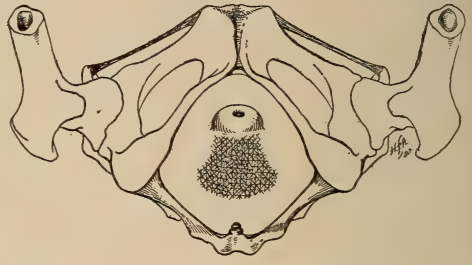


FIG. 121.—Touch picture. Simple digital examination and schematic outline of retroflexioversion. The cervix is directed forward: the body of the uterus can be felt through the posterior wall.

marked cases of retroposition the body of the uterus may be felt through the posterior vaginal fornix, and often also an angle of flexion between the cervix and the body. An ovary prolapsed into Douglas' pouch is easily detected.

While this simple digital examination yields considerable information, no examination is complete without bimanual palpation. By this method

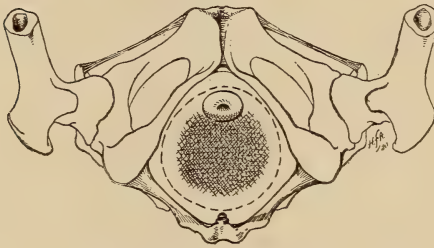


FIG. 122.—Touch picture. Simple digital examination and schematic outline of pelvic mass. The cervix is forward under the symphysis: back of it through the posterior vaginal wall a rounded projecting enlargement filling the hollow of the sacrum can be made out.

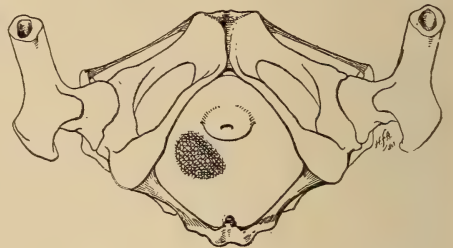


FIG. 123.—Touch picture. Schematic outline showing prolapsed ovary palpable on digital examination. A body about the size of an olive is felt through the posterior vaginal fornix, slightly to one side of the median line.

the pelvic organs are picked up one after the other between the palpating hands, and their size, mobility, consistency, and sensitiveness are estimated. The feasibility of a satisfactory bimanual palpation in a given case will depend upon the degree of relaxation of the abdominal muscles which the patient is able to induce voluntarily, and upon the amount of adipose tissue present in the abdominal walls. Rigid or thick abdominal parietes render bimanual examination difficult or unsatisfactory unless an anæsthetic is employed.

In bimanual palpation (Figs. 120 to 127) the palmar surface of one hand is placed upon the abdominal wall, and one or two fingers of the other hand are introduced into the vagina or into the rectum (Fig. 128). Palpation is made first with the organs in the position in which they are found. Later, except in acute or subacute pelvic inflammatory disease, if it is found desirable, bimanual palpation may be made with a finger in the rectum while the uterus is drawn downward by means of a tenaculum. This maneuver brings the entire posterior surface of the uterus within reach of the examining finger and permits a minute examination of the posterior surface of the broad ligaments and of the pouch of Douglas to be made.

In bimanual palpation the cervix is located with the vaginal finger and the direction of the cervical axis in relation to that of the vagina is noted. Normally the cervix is at almost a right angle and points toward the coccyx.

If it is found in the axis of the vagina, it is quite likely that the uterus is retroverted or that the patient is suffering from an acute anteversion of the cervix. The body of the uterus is the next to be examined. If it is in normal position—anteversion and anteversion

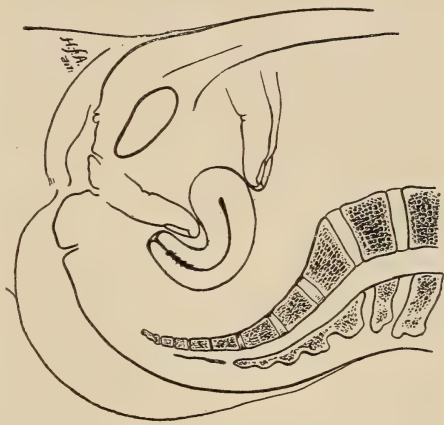


FIG. 124.—Bimanual examination and schematic outline of anteversion and pathologic anteversion. (To be studied in connection with Fig. 120). The sharp angle between the cervix and the body can be felt. The body of the uterus may be caught between the vaginal finger and the suprapubic fingers.

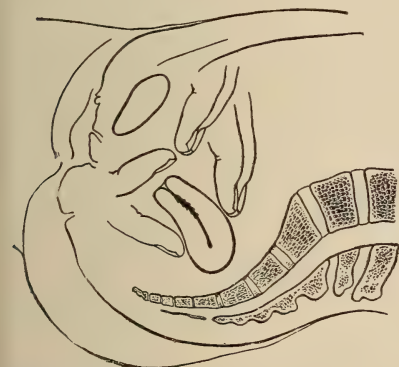


FIG. 125.—(Study in connection with Fig. 121.) Bimanual examination and schematic outline of retroflexioversion. The body of the uterus cannot be felt between the finger in contact with the anterior vaginal wall and the suprapubic fingers. The body of the uterus is posterior and is felt between a finger on the posterior vaginal wall back of the cervix and the abdominal fingers.

the position, the size, consistency, mobility, shape, and sensitiveness of the uterus may be determined.

In palpating the left adnexa (Fig. 129) the vaginal finger is carried to the

normal position—anteversion and anteversion—it may be palpated between the vaginal finger placed upon the anterior vaginal wall, just in front of the cervix, and the abdominal hand pressed downward and toward the pelvic outlet in the median line above the symphysis. If the fundus is not located by such a maneuver, there is evidence of malposition. The vaginal finger is now carried back of the cervix along the posterior vaginal vault, while the abdominal hand is passed downward below the sacral promontory. In cases of well-marked retroversion the posterior surface of the body of the uterus will be felt inclining backward toward the sacrum, and if retroflexion is present, the angle between the cervix and the body can readily be made out. In addition to

extreme left lateral part of the vaginal fornix, and pressed upward along the pelvic wall as far as possible, while the abdominal hand is gently pressed downward and forward over the brim of the true pelvis to the left of the sacral promontory. The finger in the vagina and the fingers of the abdom-



FIG. 126.—(Study in connection with Fig. 122.) Bimanual examination and schematic outline of pelvic mass. The uterus and the pelvic mass may be recognized as separate bodies.

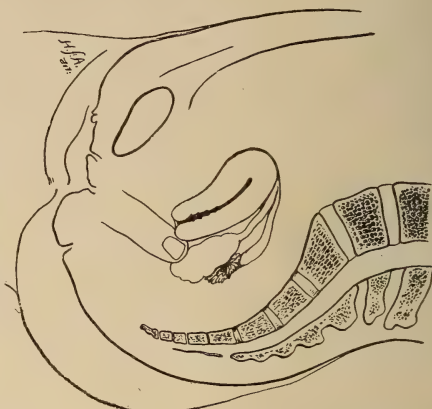


FIG. 127.—(Study in connection with Fig. 123.) Simple digital examination and schematic outline of prolapsed ovary.

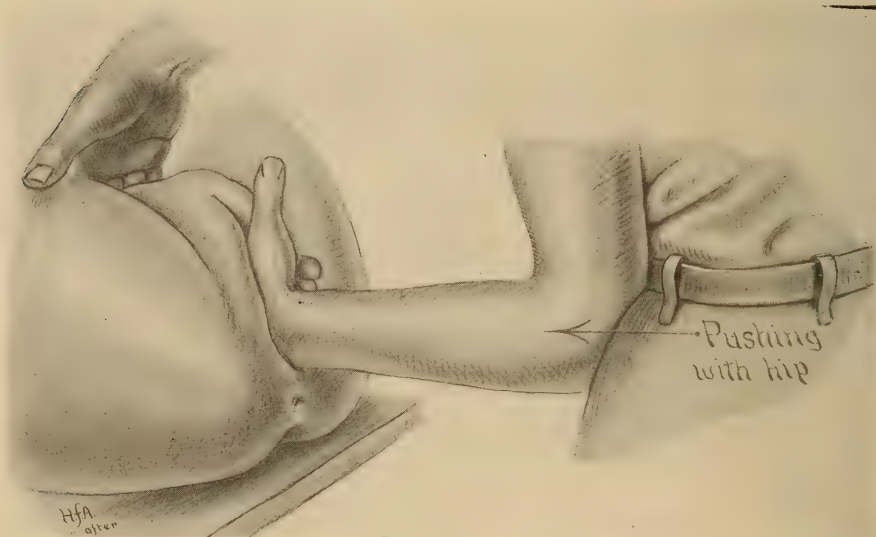


FIG. 128.—Position of hands in bimanual examination of the pelvis. The elbow supported by the hip indents the perineum and permits a free manipulation of the fingers of the palpating hand.

mal hand are approximated at the highest lateral and posterior position possible and then drawn gently forward. By this means the normal ovary and tube are brought between the fingers. The normal ovary is felt as a smooth, elliptic body, about the size of an almond, which slips or slides from the touch and is freely movable. The normal tube is made out with

difficulty, giving to the examining finger the impression of a very soft rubber tube about the caliber of a lead-pencil. It is only in exceptional cases that the examiner can be certain that the tube is felt. Muscular strands in the abdominal wall or the round ligament will often be mistaken for a normal tube. The right adnexa may be palpated by similar manœuvres on the opposite side.

If the ovary is adherent, the organ will be felt to be immovable and somewhat enlarged, and as though it were attached to the pelvic wall or floor. If the tube and the ovary are enlarged and adherent, they form an irregular, retort-shaped mass in which it is difficult to distinguish one organ from the other.

It must be remembered that the position of the uterus will influence the position of the ovary. Thus, if the uterus is retroverted or prolapsed, the ovary will be lower and nearer the median line; when the uterus is in the normal position, the ovary will be higher and more laterally situated. When the ovary is prolapsed (Fig. 127), it may be felt by turning the palmar surface of the finger backward and palpating Douglas' cul-de-sac by pushing backward and outward. The ovary will be recognized as a smooth, elliptic

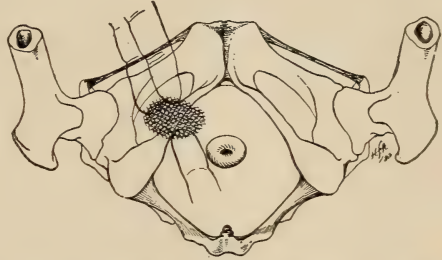


FIG. 129.—Schematic outline showing the relative position of the vaginal and abdominal fingers in bimanual examination of the tube and ovary.

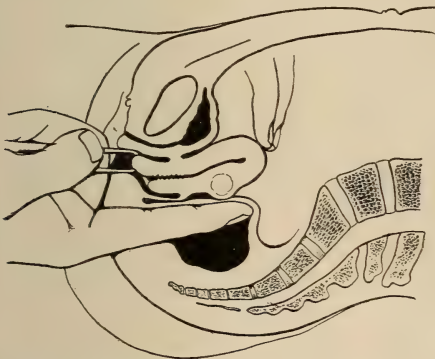


FIG. 130.—Bimanual examination with uterus drawn down and a finger in rectum. The entire posterior wall of the uterus is made accessible to the rectal finger in this way.



FIG. 131.—Combined recto-vaginal examination. Index finger of lower hand in rectum, thumb in vagina. Other hand in usual position on abdomen. Method is useful in locating position of cervix in relation to intra-pelvic masses.

body that slips away from the examining finger. A scybalous mass in the rectum gives to the finger a sensation much like that of a prolapsed ovary; but the latter may be excluded by noting that the former pits on pressure or as the result of an examination made per rectum.

Bimanual rectal palpation (Figs. 130 and 131) with the uterus drawn downward by means of a tenaculum is a most valuable aid to diagnosis in affections of the tubes and ovaries. The finger is inserted into the rectum

and pushed backward and downward until it passes between the uterosacral ligaments; it is then turned upward upon the posterior surface of the uterus, and to either side upon the posterior surface of the broad ligaments. In making a bimanual examination with a finger in the rectum, it is sometimes advantageous to insert the thumb in the vagina in order accurately to ascertain the position of the cervix; by this means also the thickness of the rectovaginal septum may be estimated. The method is chiefly useful, however, for distinguishing between uterine and other pelvic enlargements.

In the case of inflammatory affections of the ovaries and tubes, irregular masses will be felt back of the uterus on one or on both sides, displacing it forward. When an inflammatory affection involves the cellular tissue of the

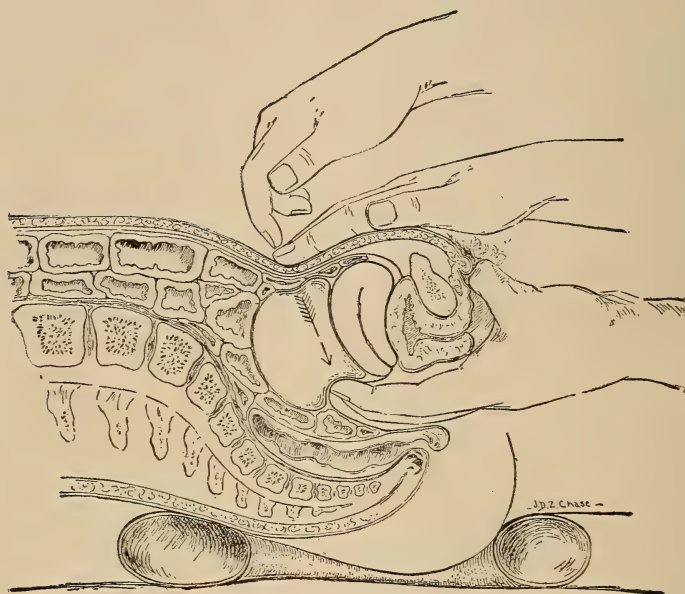


FIG. 132.—Trimanual examination, case of ovarian cyst. (Clark.)

broad ligaments, a dense, board-like induration is felt at the vaginal vault extending all the way to the pelvic wall and fusing with it.

Pelvic masses occurring without induration of the vaginal fornices or the bases of the broad ligaments are usually uterine or ovarian in origin—uterine, if they are in connection or move with the uterus; ovarian, if they are distinctly separate from, and independently movable of, the uterus. Induration of the broad ligaments or the vaginal fornices, with immobility or partial fixation of the uterus, is suggestive of inflammatory disease involving the tubes and the pelvic peritoneum; it is indicative also of carcinoma with extension to the broad ligament or of cellulitis. Pelvic enlargements arising slightly above the pelvic brim and decidedly lateral in position are, as a rule, inflammatory or malignant in type. Those that occupy a more or less median position and extend well into the abdominal cavity are usually new growths of the uterus or of the ovaries.

Trimanual examination (Fig. 132) is especially valuable for determining whether a pelvic tumor is cystic or solid in nature. In conducting this examination the tumor mass is confined as closely as possible between the two examining hands, "while the percussion is made by an assistant. With light, quick taps, even small collections of fluid may be detected by the quick, responsive, pulsatile wave passing from the abdominal to the pelvic hand" (Clark).

This method is valuable also in differentiating between semi-solid and cystic tumors; as, for example, in differentiating between a soft intra-ligamentary myoma with associated inflammatory disease of the appendages and a pelvic abscess, or in distinguishing a dense hydrosalpinx or pyosalpinx from a solid tumor.

Abdominal Examination.—The abdominal examination may precede or follow the pelvic examination.

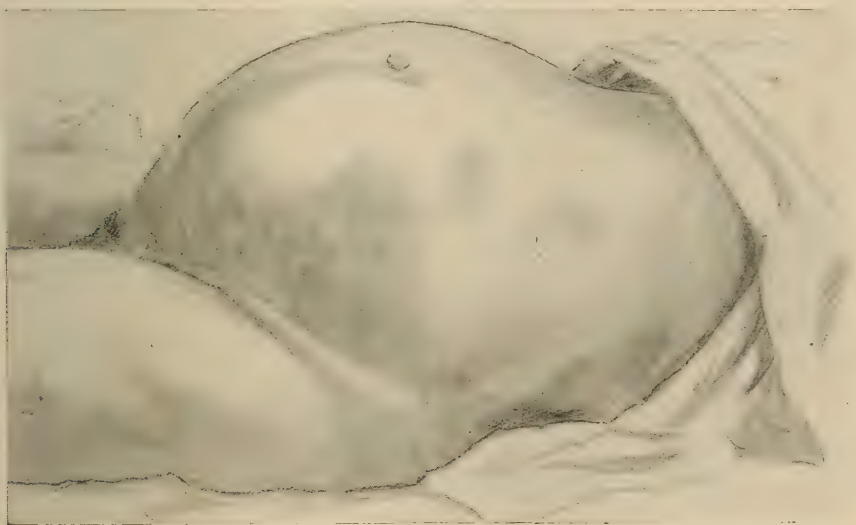


FIG. 133.—Lateral aspect of abdomen with large myomatous uterus. Note the slight irregularity of the surface, and the sharp suprapubic rise and epigastric fall. (University Hospital.)

Inspection.—The abdomen should be inspected from the sides, from the foot, and from the head as the patient lies in the supine position, and from the side as she stands erect. Inspection at once discloses the color of the skin, the evidence of previous counter-irritation and the scar of former operations; enlargement of the cutaneous veins significant of femoral, iliac, mediastinal or portal obstruction may also be observed. The linea albicantes, usually indicative of past or present pregnancy, may be seen. The uniform enlargement common in tympanites, large ascitic collections, and thin-walled cysts filling the entire abdomen is to be noted. The flattened surface and bulging flanks of the relaxed or the moderately ascitic abdomen, the scaphoid surface indicative of emaciation, the enormously thick panniculus adiposus of the abdominal wall, the pendulous abdomen when the patient is erect, are revealed at the first glance. If the abdomen is protuberant

or distended in such a way as to suggest an abdominal tumor, the examiner should note whether the entire abdomen or only a particular area is affected; whether, in the case of a median enlargement affecting the lower part of the abdomen, both sides are equally involved; whether the surface of the enlargement is regular or irregular; whether the abdominal respiratory wave affects the entire abdominal wall uniformly (tympanites, fat); whether a localized enlargement moves with respiration (kidney, gall-bladder, and stomach tumors, unless adherent) or is fixed; and whether the respiratory wave stops at a point where the abdominal wall is splinted by the underlying tumor (uterus and ovary).



FIG. 134.—Anterior aspect of abdomen, with large myomatous uterus, deviated to right. Note the slight irregularity of the surface and the greater prominence on the right side. (University Hospital.)

Palpation.—Palpation confirms some of the observations made by inspection, as, for example, the degree of abdominal distention and the localization of regional enlargements; it also elicits much additional information. It determines the respiratory mobility or immobility of the tumor, and discloses rigidity or flabbiness of the abdominal muscles, tenderness, and muscle spasm. Palpation reveals the nature of an abdominal enlargement, making it possible to differentiate between the soft panniculus of the excessively fat abdomen, the tense elastic resistance of a cyst, and the hard, unyielding mass of a solid abdominal tumor. The thickness of the adipose

layer of the abdominal wall may be judged by picking up the layer of fat between the two hands.

Palpation determines more or less accurately the point of origin of an abdominal tumor, and supplies information as to the organ from which it springs. In the case of an abdominal tumor springing from the pelvic organs the fingers pressed into the abdominal wall above the symphysis meet with firm resistance. Similarly in most abdominal tumors the greater part of the periphery is usually free and distinctly palpable, whereas as the point of origin of the growth is approached it fuses with the organ from which it sprang and may be more or less indefinite in outline (*e.g.*, gall-bladder enlargements, splenic growths). The passive mobility of tumors varies. Intraperitoneal neoplasms, pedunculated uterine and ovarian tumors, and intestinal and mesenteric growths are usually freely mobile—*i.e.*, they can be moved freely toward the umbilicus—but they generally show a tendency to return to the area from which they grew. Conversely, retroperitoneal growths and kidney, suprarenal glands, and pancreatic tumors are more or less fixed. The same is true of inflammatory tumors and of those that are adherent, as well as of malignant infiltrating growths (Figs. 133 to 139).

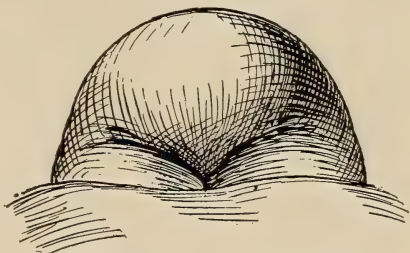


FIG. 135.—Anterior aspect of abdomen, with extreme ascitic distention; same case as Fig. 136. Note uniform and symmetrical distention. (Stetson Hospital.)

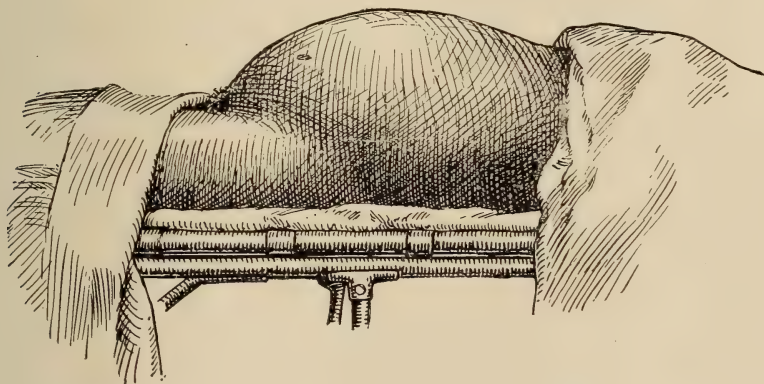


FIG. 136.—Lateral aspect of abdomen, with extreme ascitic distention. Note the gradual suprapubic rise and epigastric fall. (Stetson Hospital.)

The presence of fluctuation is elicited by palpation and percussion. By this means collections of fluid may be distinguished from gaseous or solid enlargements. Fluctuation may be simulated by fat, but the percussion wave in the latter may be checked by pressure of the ulnar surface of an assistant's hand between the palpating and percussing fingers. Thick, tensely-walled cysts may give indefinite fluctuation, and may be mistaken for elastic resilient solid tumors. In large ovarian cysts which contain one large and many small cavities fluctuation may be elicited over the main cavity,

but not over the smaller ones. Fluctuation is sometimes best elicited by the trimanual method of percussion (*vide supra*).

Before making palpation the hands should be well warmed. The palmar surface should be pressed gently against the abdominal wall, making deeper

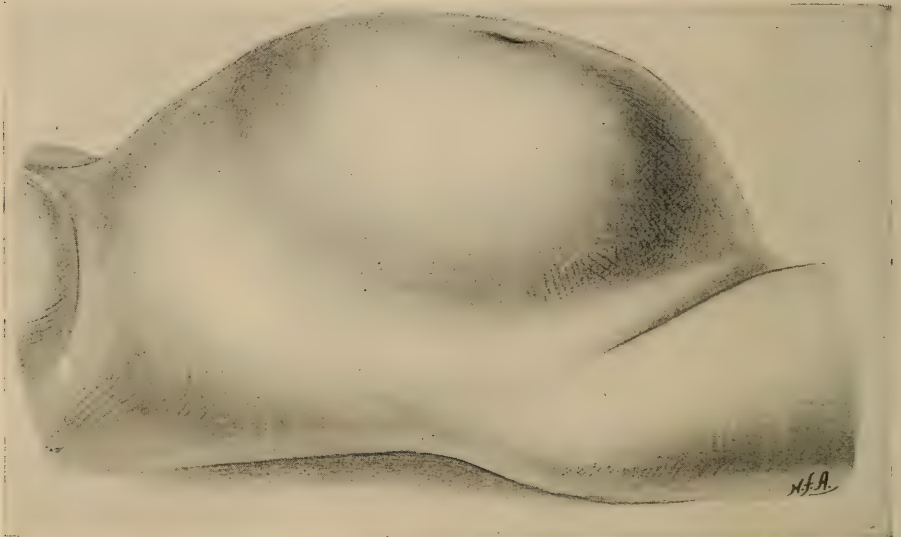


FIG. 137.—Lateral aspect of the abdomen in a case of large ovarian cyst. (Philadelphia Hospital.)

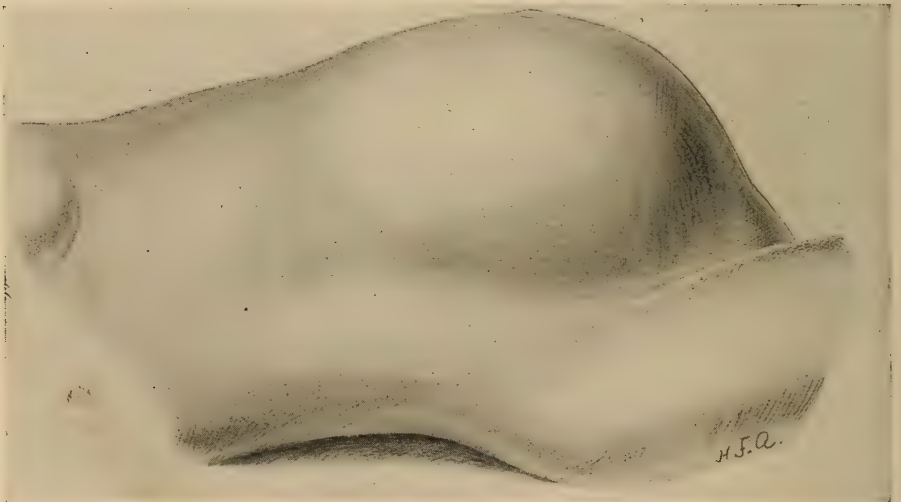


FIG. 138.—Lateral aspect of the abdomen in a case of pregnancy near term, primigravida. (Philadelphia Hospital.)

pressure with the fingers as the patient's confidence is gained and the abdominal wall relaxes.

Percussion.—All intraperitoneal abdominal tumors having their origin in the pelvis and of sufficient size to cause abdominal distention exhibit a

dull or a flat note over the summit of the growth. This is continued toward its point of origin—for example, in the case of pelvic tumors, as far as the symphysis—whereas the percussion-note becomes resonant or tympanitic in the remaining peripheral areas (“coronal resonance”). These are dependent upon the approximation of the tumor with the abdominal parietes and the consequent displacement of the intestines. When an intraperitoneal abdominal tumor is small and lies among the intestinal coils and not against the abdominal wall, the percussion-note over it may be unchanged or very slightly altered (Figs. 140 and 141).

Retroperitoneal abdominal tumors, even when of large size, on percussion invariably exhibit resonance or tympany over the area of greatest convexity. In the case of extremely large growths, this resonant or tympanitic



FIG. 139.—Lateral aspect of the abdomen in a case of ovarian cyst with extreme carcinoma-tosis of the abdominal cavity. (Philadelphia Hospital.)

note may not be marked, but it is almost always recognizable on light percussion. The reason for this is obvious, since the growth, having its origin back of the peritoneal investments of the intestines, as it increases in size, necessarily pushes the intestines forward.

Percussion is valuable also in detecting the presence of free fluid within the peritoneal cavity. Whenever an intraperitoneal collection of fluid comes in contact with the abdominal parietes, the percussion-note over the point of contact is dull. Thus, when a moderate ascites is present and the patient lies flat on the back, the fluid gravitates into the flanks, where it produces dulness upon percussion, whereas the intestines, floating upon the surface of the fluid and being, therefore, most prominent, give a resonant or tympanitic note in the median line of the abdomen. If the patient is turned upon one side, the fluid gravitates to that side, increasing the area of dul-

ness here, whereas the other side now clears up and the note becomes resonant or tympanitic. So, too, if the patient stands erect, the dulness is manifest over the lower part of the abdomen, directly across from one side to the other, and to a varying degree above the symphysis. It is only in

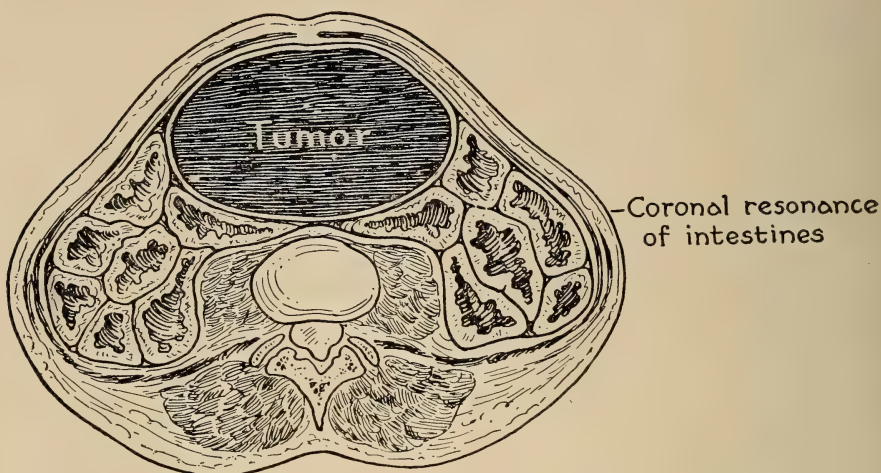


FIG. 140.—Schematic cross section of the abdomen to show reason for coronal resonance in abdominal tumors.

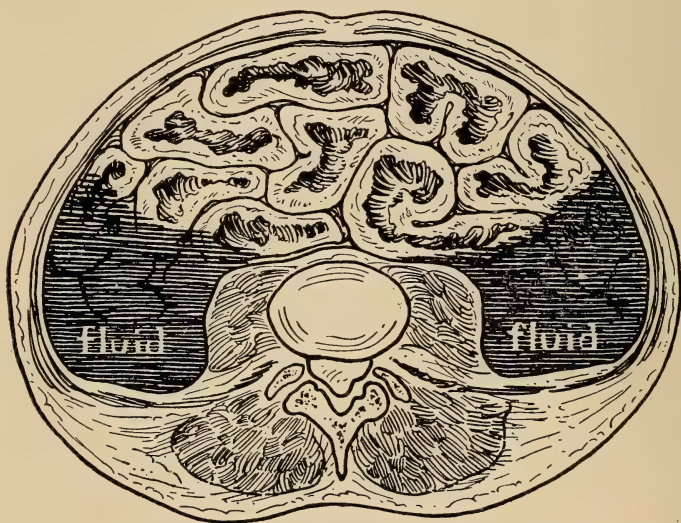


FIG. 141.—Schematic cross section of the abdomen to show reason for central resonance and lateral dulness in fluid collections, ascites.

the case of intraperitoneal collections of fluid large enough to distend and fill the entire abdomen that the percussion-note is uniformly dull. When an intraperitoneal collection of fluid becomes encysted (*e.g.*, in tuberculosis, peritonitis, carcinomatous ascites) there may be no alteration in the dulness produced by changes in posture.

Auscultation.—Auscultation determines the activity of the intestines by demonstrating frequency and character of the peristaltic sounds. The normal fine gurgling sounds of the intestine may be contrasted with the exaggerated, almost continuous peristaltic borborygmi in flatulent distention and early obstruction, or with the diminished, infrequent, or entire absence of peristaltic action in a dynamic ileus or peritonitis.

Auscultation discloses the foetal heart-sounds in pregnancy after the fifth month, and the placental bruit in the later months of gestation. Exceptionally a bruit may be heard over abdominal tumors that press upon the large blood-vessels at the brim of the pelvis.

Mensuration of the abdomen is valuable chiefly for noting accurately the growth of abdominal tumors. Fixed points on the circumference around which the measuring tape may be applied should be selected. When the comparative measurements are made within a few days of each other, the lines of measurement should be indicated with an indelible pencil. One circumference passes through the anterior and the posterior iliac spines; another, through the umbilicus, and a fixed point on the spine at the position of the forward limit of the lumbar curve; another circumference cuts the lower costal margin on each side and is perpendicular to the spine. Longitudinal measurements are also of use, notably that made from the ensiform process to the upper limits of an abdominal tumor, and from that point to the symphysis pubis.

Remote Abdominal Organs.—A routine examination should be made of the gastric, gall-bladder, appendiceal, and renal areas, to determine the presence of enlargements, tenderness, or displacements. It is hardly necessary to point out that tumors of the stomach, gall-bladder, appendix, and kidney may occasionally resemble new growths of pelvic origin, or that symptoms arising from diseased conditions of these organs may closely simulate those of pelvic disorders. Moreover, if operative procedure on the pelvic organs is contemplated, it may be advisable to correct lesions in the abdominal viscera at the same time, and thus the plan and scope of the operation may be modified.

BIBLIOGRAPHY

- ANSPACH, BROOKE M.: *Martin's Surgical Diagnosis*. Lea and Febiger, Phila., 1909.
KELLY, H. A.: *Operative Gynecology*. Appleton, New York, 1899.
WINTER, G., AND RUGE, C.: *Gynecologic Diagnosis*, Edited by J. G. Clark. Lippincott, Phila., 1909.

CHAPTER IX

EXAMINATION OF THE URINARY ORGANS

Urinalysis.—The urinary output is an index of the condition of the secretory and excretory urinary organs. The chemical methods of examination do not differentiate between lesions of the kidney, ureter, and bladder, but when examined microscopically, some points of difference may be found. (See Urinalysis, Chapter VII, page 108.)

PALPATION

Urethra.—The urethra is palpable throughout its entire length, the palpation being made per vaginam. The finger is lubricated and applied to the anterior vaginal wall. The internal urinary meatus is situated about halfway between the vaginal introitus and the cervix. The contents of the urethral canal may be expressed by “milking” the urethra. Undue sensitiveness may be indicative of urethritis, and suburethral abscess or cyst may be detected by this method. Palpation should be combined with inspection. (See pages 123 and 140.)

Bladder.—The bladder may be palpated during the course of the ordinary bimanual pelvic examination, and in this way a tumor or a calculus of large size may be discovered. Small calculi easily elude palpation, and for their detection a more effectual method of examination (*e.g.*, cystoscopy) is necessary. A diagnosis of stone in the bladder may also be made by the use of a vesical sound. The bladder is distended with water and an ordinary searcher is introduced; a finger in the vagina may serve as a point of resistance.

Ureter.—Palpation of the ureter is performed through the vagina or the rectum. The position of the hands is similar to that employed in bimanual pelvic palpation. The vaginal finger is passed to the cervix and then to the right or the left side, upon the surface of the vaginal fornix. The abdominal hand is meanwhile pressed downward, as in palpation of the adnexa, and when the tissues of the broad ligament are thus fixed, the fingers of the two hands are approximated and brought forward in an attempt to roll the ureter between them. If the ureter is enlarged it may be felt just in front and to one side of the vaginal cervix; it feels like a thick cord, of about the caliber of a pencil, and may be extremely tender to the touch. In making bimanual rectal palpation the procedure is similar to that just outlined; the cervix is readily located through the rectovaginal septum.

Kidney.—In palpating the kidney the patient is placed upon her back, the shoulders being slightly raised, and the knees and thighs flexed and resting upon pillows. One hand of the examiner is placed posteriorly in the angle between the lower border of the ribs and the spine; the other hand is placed anteriorly below the border of the ribs in a corresponding position. The patient is now directed to take deep breaths and then to allow the air to escape from the lungs by rapid expiration with full relaxation of the

abdominal wall. At the very beginning of this expiratory act the tips of the examiner's fingers are pressed deeply into the abdomen beneath the border of the ribs, and then gradually downward, in an endeavor to get the kidney between the two hands. If the kidney occupies its normal position, the lower pole may be felt; but occasionally, especially in fat subjects, it is not palpable. In the moderately movable kidney of normal size the lower pole only may be palpable below the costal margin at the beginning of expiration. If the kidney is unduly mobile, the deep inspiration forces the organ downward and the examiner's fingers pressed into the abdomen below the ribs push it below the costal margin. Anterior and posterior pressure can then be maintained by the thumb and fingers of the posterior hand, the

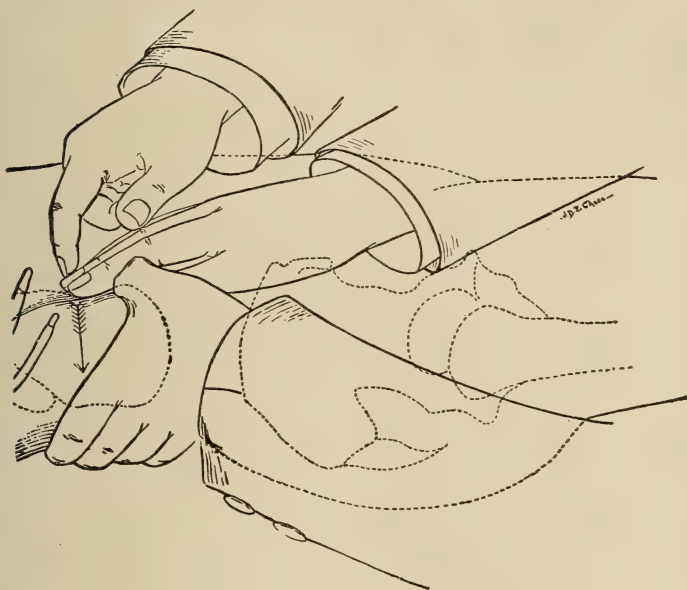


FIG. 142.—Trimanual method of percussion of kidney. (Clark.)

anterior hand then being free directly to palpate the anterior surface of the displaced kidney. In this way the size, regularity of surface, consistency, etc., of the kidney may be ascertained. A movable kidney that is otherwise healthy is not, as a rule, tender, except during or immediately after a Dietl's crisis. At this time, however, the kidney is extremely sensitive, and the abdominal wall covering it may be very rigid and spastic; this is true also of cases of pyelitis complicating pregnancy or of any acute surgical condition of the kidney.

In chronic surgical affections of the kidney, as, for example, tumor, large hydronephrosis, etc., the enlargement of the organ is evident, and simple palpation of the suspected region will readily reveal the condition. In renal calculus the kidney may not be palpable, but on making pressure over the kidney area, especially in the costovertebral angle, tenderness will probably be noted.

Early tuberculosis of the kidney may be present without any apparent enlargement of the organ, although, as a rule, tenderness on deep pressure is noted. In many instances of inflammatory lesions of the kidney a certain degree of lumbar rigidity will be observed. In pronounced enlargement of the kidney, the mass is readily made out, occupying a position between the ribs and the anterior superior spines anteriorly, and filling up the loin posteriorly. If a fluid accumulation is present, fluctuation may readily be distinguished, and for this purpose trimanual palpation will be found of particular advantage (Fig. 142).

PERCUSSION

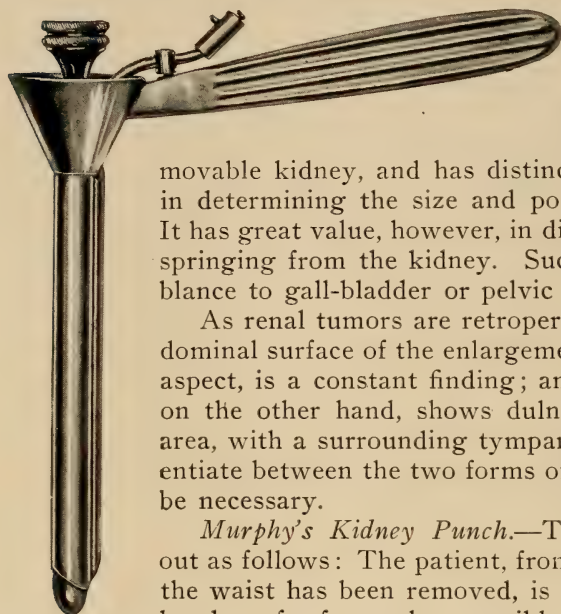


FIG. 143.—Kelly's improved cystoscope, with electric bulb.

Percussion as an aid to diagnosis of kidney conditions is of no value except in massive enlargement of the organ. It is not used in making the diagnosis of

movable kidney, and has distinctly less value than palpation in determining the size and position of an enlarged kidney. It has great value, however, in diagnosing an abdominal tumor springing from the kidney. Such tumors may bear a resemblance to gall-bladder or pelvic enlargements.

As renal tumors are retroperitoneal, tympany over the abdominal surface of the enlargement, especially upon the mesial aspect, is a constant finding; an intraperitoneal enlargement, on the other hand, shows dulness over the most prominent area, with a surrounding tympanitic zone. In order to differentiate between the two forms of growth light percussion may be necessary.

Murphy's Kidney Punch.—This diagnostic aid is carried out as follows: The patient, from whom all the clothing above the waist has been removed, is seated upright on a stool and bends as far forward as possible. The examiner's left hand is then placed flat over the kidney of either side, and pressed firmly against the body. With the clenched right fist a sharp blow is then struck on the dorsum of the left hand. If acute congestion, infarction, retention of fluid in the kidney pelvis, or ureteral obstruction exists, the patient will cry out with pain. As a rule, no expression of pain is elicited by striking over a healthy organ.

INSPECTION

Urethra—Urethroscopy.—The external urinary meatus is exposed by separating the smaller labia. In the normal nulliparous woman the meatus is a small slit, often hard to detect in the surrounding mucosa of the vestibule. In the woman who has borne children the orifice may stand open, and may exhibit a tendency to gape and expose the mucosa of the urethra and the openings of Skene's tubules. Prolapse of the urethral mucosa and urethral caruncle may readily be observed.

In acute urethritis the mucosa of the urethral orifice is seen to be swollen

and red. In chronic urethritis, which is almost invariably due to gonorrhœal infection, Skene's tubules are prominent, and their orifices may be elevated and reddened (gonorrhœal macule); they often contain pus, which may be expressed by making slight pressure from below. The mucosa just inside the urethral orifice may be inspected by separating the lips of the urethra with a delicate wire speculum. For inspecting the deeper urethra a cylindric speculum with an obturator is required. The end of the instru-

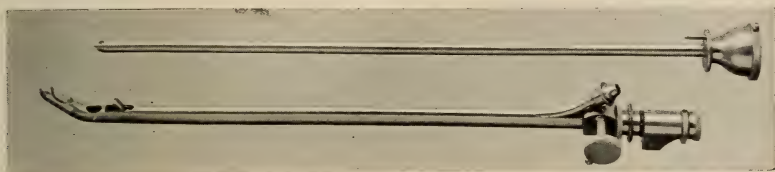


FIG. 144.—Nitze catheterizing cystoscope, single.

ment should be fitted with a small incandescent lamp, although light may be reflected through the barrel of the instrument by means of a head-mirror.

In performing urethroscopy the bladder is emptied. The speculum is well lubricated and passed through the vesical neck into the bladder, and the obturator then removed. The instrument is now slowly withdrawn until the folds of the vesical sphincter begin to close over the end of the speculum. As the instrument is withdrawn the mucosa of the entire canal may

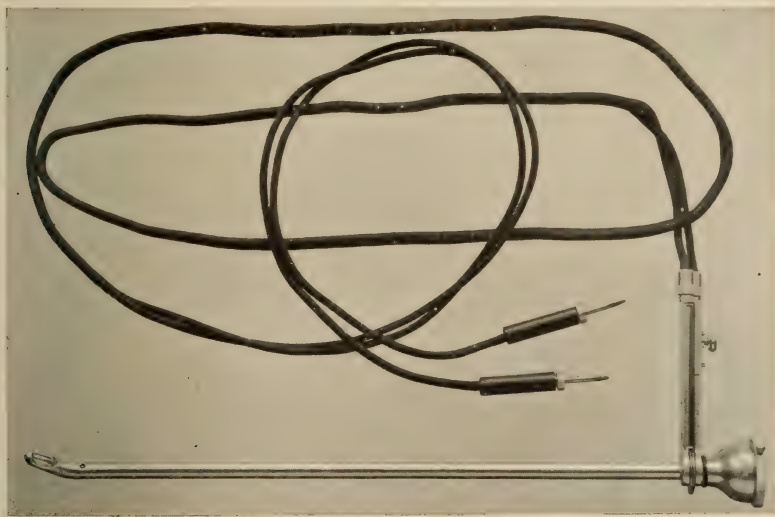


FIG. 145.—Nitze examining cystoscope.

be inspected from within outward. Fissure of the neck of the bladder, patches of chronic urethritis, the opening of a suburethral abscess, and the presence of infected follicles on the floor of the urethra may be discovered in this way. In order to correctly interpret the findings a certain amount of experience is necessary. The urethroscope should be short and the interior of the barrel darkened. A very fine, flexible, solid silver probe will be useful in locating infected follicles or in finding the opening of a suburethral abscess.

Bladder and Ureteral Orifices—Cystoscopy.—Cystoscopy is probably the most valuable and certainly the most useful method of examination at our command in surgical conditions of the bladder, ureter, and kidney. Cystoscopy, as the name implies, is direct inspection of the interior of the bladder.



FIG. 146.—Cylindrical jar for sterilization of cystoscopes.

By its means the mucosa and the ureteral orifices are directly exposed to view. In addition to morbid anatomic changes in both, the physiologic actions of the ureters can thus be studied. Since the activity of the ureters is dependent more or less directly upon the kidneys themselves, cystoscopic inspection yields considerable information concerning these organs. This is particularly true of chromo-uretero-cystoscopy. Furthermore, by sounding or catheterizing the ureters and by applying the methods that will subsequently be detailed, the condition of each kidney may be most accurately determined.

Methods of Cystoscopy.—Several methods of performing cystoscopy are in vogue at the present time, each of which has its advantages and disadvantages. A very efficient but somewhat difficult method is that suggested and elaborated by Kelly. It consists of introducing a cylindric speculum (Fig. 143) into the bladder, with the patient in the knee-chest, Sims', or elevated dorsal position, so that the bladder becomes distended by atmospheric pressure and its interior is exposed for inspection directly through the barrel of the instrument. The disadvantages of this method are that the patient is placed in a somewhat uncomfortable position, that dexterity and prolonged practice are required to secure good results, and that since a speculum of considerable size is necessary in order to obtain a good view, the examination is somewhat painful. It has the advantages of requiring no complicated apparatus and of giving a direct view. Furthermore, local applications may be made or even simple intravesical operations performed through the open barrel of the speculum.

Another method of performing cystoscopy is to distend the bladder with fluid and introduce a cystoscope that carries a light for illumination at its extremity and that possesses a series of mirrors and lenses through which the bladder may be viewed (Fig. 144). There is usually some magnification of

the bladder mucosa. The method possesses the following advantages: For simple inspection an instrument only slightly larger than the ordinary catheter is required (Fig. 145); it causes but little pain and no discomfort, since the patient may lie in the ordinary dorsal position; less practice is required to perform the cystoscopy satisfactorily; the urethral orifices may be located with comparative ease, and ureteral catheterization may be practised without much difficulty. Its disadvantages are that a complicated and expensive instrument is required, while intravesical operations or applications, although possible, become more difficult and make an especially designed instrument necessary.

General Preliminaries.—All cystoscopic examinations should be conducted under aseptic precautions. The external genitalia should be washed with green soap, water, and bichloride solution (1:1000). For simple cystoscopic examinations the vulva need not be draped with sterile covering, but if the ureters are to be catheterized, this forms a very important part of the technic.

The Kelly cystoscopes may be sterilized by boiling. Cystoscopes fitted with lenses should be sterilized by immersing them for thirty minutes before using in a 1:500 solution of formalin. Simple examining cystoscopes should be placed vertically in a narrow cylinder jar (Fig. 146), the eye lens-system not being immersed. Catheterizing cystoscopes must be entirely immersed. They are either provided with a cap that protects the eye



FIG. 147.—Ureteral catheter.

lens-system during the immersion, or they are so constructed that the lens-system may be completely separated from the instrument and sterilized by the method used for the simple examining cystoscopes.

Ureteral catheters (Fig. 147) should, after use, be thoroughly but gently washed with castile soap and cold water. The lumen should be repeatedly flushed with water. This is best done in the following way: The catheters are suspended over the edge of a pitcher filled with cold sterile water, the eyes of the instruments being near the bottom of the pitcher and the butts hanging outside, reaching a lower level, so that siphonage may take place. The result is a continuous washing of the lumina for two or three hours, according to the amount of water used. The catheters should now be flushed with a 1:500 formalin solution, hung up, and allowed to dry. They should then be placed in the formalin gas sterilizer (Fig. 148).¹

¹ Catheters which are to be used with the Kelly cystoscope must be kept straight and rigid; this is best accomplished by introducing a wire stylet into their lumen. This facilitates the introduction of the catheter through the open barrel of the cystoscope.

If it is found necessary to use a catheter that has become infected within twenty-four hours, the instrument should be flushed and then immersed in a cold 1 : 100 solution of formalin for at least thirty minutes. Hot water and alcoholic solutions affect the varnish of a catheter and quickly ruin it.

Technic of the Direct Method with Atmospheric Distention of the Bladder—Kelly's Method.—A small pledget of cotton soaked in 10 per cent. cocaine is introduced into the urethra. After a few minutes the pledget is removed and the patient is directed to empty the bladder. She is then placed in the knee-chest or in the Sims' position, and the external urethral orifice is dilated up to 10 mm. The dilator (Fig. 149) should be well lubricated and a gentle boring motion should be employed. The speculum is gently introduced into the bladder, making sure that the instrument is well

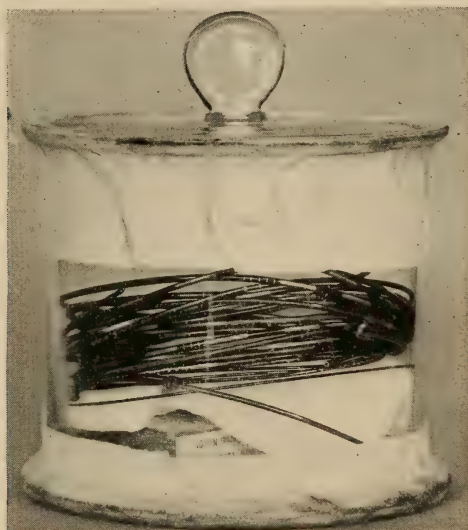


FIG. 148.—Sterilizing ureteral catheters; jar with ground glass lid; formalin pastilles and vapor.

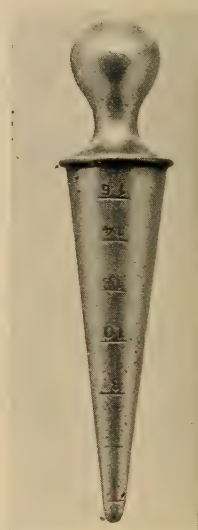


FIG. 149.—Urethral calibrator.

within the internal urethral orifice when the obturator is withdrawn. Upon its withdrawal the air rushes through the speculum and distends the vesical cavity.

It is customary to inspect first that part of the bladder directly opposite the end of the speculum, and which corresponds usually to the vertex of the bladder; then, by sweeping the end of the instrument in various directions, to go over the entire mucosa, finishing with that part at the base of the bladder, just within the internal urethral orifice, known as the trigone.

The trigone is the triangular area between the internal urethral orifice and the two ureteral openings. It is bounded posteriorly by a fold known as the interureteric ridge. In order to locate these anatomic points it is advisable, after completing the general inspection of the bladder, to withdraw the speculum until the internal urethral orifice begins to fold over its extremity. The speculum is then pushed into the bladder for a distance of

3 cm., and the inner end is tipped toward the base of the organ, when, as a rule, the instrument will be in close proximity to the interureteric ridge. The ureteral orifices are situated at the right and left extremity of this ridge, equally distant from the midline. They may be located by directing the speculum to the right or the left in the arc of an angle of between fifteen and thirty degrees from the midline.

Hunner believes it a good plan to locate the left orifice first, as it is usually situated nearer the internal urethral orifice than the right, and is more easily found than the latter because of the depression of the left vesicovaginal wall produced by the weight of the uterus and the cervix. The right orifice is farther up toward the sacrum.

The opening of the ureter is situated normally on a localized elevation of the mucosa termed the *mons ureteris*. As a rule, it is most prominent on the left side, and is especially well developed in women who have borne children. The appearance of the ureteral orifice varies considerably in different persons. In some it may be almost imperceptible, resembling a fine watermark in a sheet of paper, whereas in others it may be contracted and obscured by inflammatory swellings that make its detection almost impossible. A guide to the ureteral orifice is often furnished by the periodic ejection of urine.

Technic of the Indirect Method with Distention of the Bladder by Water.—In this method the patient is placed in the ordinary dorsal position, and the bladder is carefully irrigated with warm saline solution, the irrigation (Figs. 150, 151 and 152) being continued until the water returns perfectly clear. The bladder is now filled with sterile water, the patient being encouraged to retain as much as possible. With the bladder full the cystoscope is introduced. The electric lamp and lenses are so arranged that a large part of the bladder can be seen with equal clearness. The vertex of the bladder, including the area back of the symphysis, is first examined, then the sides are inspected, and finally the base of the bladder and the trigone are viewed. This inspection is accomplished by alternately advancing and withdrawing the instrument with the lens turned in various directions from the median line.

The cystoscopist should be familiar with the appearance presented by the normal bladder. Unless the distention is marked, the bladder is not spheric in outline, but is somewhat flattened on its superior surface by the



FIG. 150.—Irrigating apparatus.

fundus of the uterus and pouched on either side. At the junction of the superior movable portion of the bladder with the base or fixed portion shadows may be seen; these can be eliminated only by pressing the end of the instrument close to the bladder wall in the darkened area.

Looking toward the apex of the bladder, an air-bubble is almost invariably seen on the surface of the distending medium. The mucosa of the apex may now be studied. As a rule, it presents a clear, pinkish-white surface, in which the capillaries are distinctly traceable, sharply defined in outline, and of a bright red color.

As the lateral areas are approached the lateral folds, appearing more or less as shadows, are observed. Here and there the surface of the mucosa may be marked by an underlying ridge of connective tissue. The color of the mucosa takes on a deeper hue, and the blood-vessels are increased in number and more richly supplied with branches. At the base, in the midline, the color of the mucosa is a dull red, and the surface is no longer smooth and shining, but is thrown into fine ridges running toward the internal ureteral orifice.

By pushing the instrument back in the median line as far as it will go and elevating the beak, the uterovesical fold may be brought into view, with the depression caused by the uterus immediately beyond it. Just in front of this area is the trigone, a triangular area bounded by imaginary lines connecting the ureteral orifices and the internal urinary meatus. The instrument is now drawn forward toward the internal urinary meatus until the posterior margin of the latter begins to rise in the picture; the beak is then pushed inward about 3 cm., and directed first on one side and then on the other to a point about $1\frac{1}{2}$ cm. from the median line; in this area the ureteral orifice can usually be located.

The ureters appear as fine openings or slits in the mucosa, generally situated upon a rounded eminence. Between the two ureteral orifices a ridge of the mucosa can be seen; this is termed the interureteric ridge, and forms the base of the trigone, containing muscle-fibers that are continuous with those of the ureters. The vessels of the trigone radiate toward the ureteral orifices on either side. About the ureteral orifices may be noted the anastomosis between the ureteral and vesical capillaries.

Upon close observation of the ureters, periodically—the frequency depending upon the activity of the kidneys—the eminence will be seen to pout, bringing into relief the position of the ureter embedded in the bladder wall; it then retracts, the orifice opens, and there is an outward gush of urine. The orifice immediately closes and again becomes immobile. The ureters on the two sides act independently of each other in this periodic ejection of urine.

Departures from the normal may be noted in the capacity of the bladder; in the color and transparency of the mucous membrane; in the number, size, and outlines of the capillaries; in the shape of the interior of the bladder; in the ridges caused by the submucous connective tissue; in the position of the ureteral orifices, and in the appearance of the orifices themselves.

Capacity of the Bladder.—The average female bladder will hold from 250 to 300 c.c. of solution without causing marked discomfort to the patient. In

fixed tumors and enlargements of the uterus or adjacent parts the capacity of the bladder may be diminished because of the inability of the vesical walls to distend. In old cases of cystitis, particularly in those of tuberculous origin, the capacity is greatly diminished, due to actual contraction and shrinkage of the submucous connective and muscular constituents of the bladder wall.

Color and Transparency of the Mucosa.—In hyperæmia and acute cystitis the mucosa is of a deeper pink or red color, and the translucency is diminished. In chronic cystitis the mucosa is a deeper pink or grayish in color, lusterless, or presents a ground-glass appearance. The folds about the trigone may be greatly enlarged, swollen, and œdematous. Deposits of phosphates and pus may be observed as whitish particles that are adherent to the mucosa, or detached and floating in the distending fluid. Ulcerations appear as irregular, punched-out areas covered with whitish incrustations of pus or deposits of urinary salts.

Number, Size, and Outline of the Vessels.—The number of capillaries is increased in hyperæmia; if the condition goes on to actual inflammation, the outlines become less distinct. The medium-sized and smaller vessels become larger, but less distinct and even partly obscured by the foggiess of the mucosa. Small, red, sharply-defined points representing ecchymoses may be discerned here and there, and the slightest touch with the cystoscope may cause bleeding.

Shape of the Interior of the Bladder.—The interior of the bladder may undergo changes in shape as the result of enlargements or tumors of the uterus or adnexa, which displace or encroach upon it. In cases of chronic cystitis the contractions of the bladder wall may be irregular, deepening the shadows on one side, drawing the trigonal area more to one side, and forming asymmetric ridges and hollows.

Submucous Trabeculæ.—In chronic cystitis, particularly in those cases associated with obstruction to the urinary flow, the surface of the bladder is marked with numerous trabeculæ that cross one another in various directions, thus forming depressions, pockets, or diverticula of the mucous surface between them.

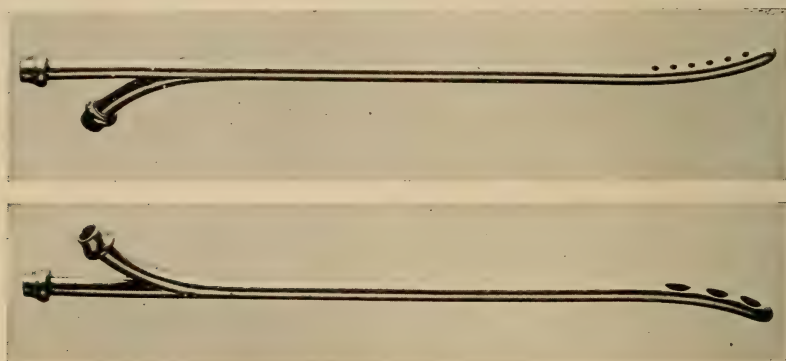
Position of the Ureteral Orifices.—Subvesical tumors may displace both orifices to one side of the median line, or produce such an irregularity in the contour of the trigone that the orifices will be completely hidden from view in the shadows or folds. In chronic cystitis with ulceration and contraction the orifices may be drawn far from their normal position and be hidden from view in the folds of swollen or ulcerated mucosa.

The ureteral orifices may be swollen and œdematous, wide open, and rigid, showing little or no tendency to periodic relaxation or contraction, and slight or no swelling or retraction of the intramural part. Or the orifices may be "dead," entirely inactive, and evincing no contractions and no ejections. They may be plugged with pus or excavated as the result of ulceration. One orifice may eject twice as often as its fellow.

Catheterization of the Ureters.—After inspection of the bladder, if it is found desirable to catheterize the ureters, the simple examining instrument is withdrawn and the catheterizing cystoscope is introduced in its stead. A

rigid aseptic technic must now be observed. Theoretically, the direct method of cystoscopy is not so safe as the indirect method, for in the latter the catheters (Fig. 153) pass through a sterile medium (water) or a weak antiseptic solution (1:5000 mercury oxycyanide). If the bladder is sterile or has been thoroughly irrigated there is no great danger in either case. Nevertheless, catheterization of the ureters should not be practised when the bladder is infected unless no other method of diagnosis will suffice. For the purpose of collecting the urine from each kidney separately the ureteral catheter need be inserted a distance of only a few centimeters.

Catheterization of the Ureters by the Direct Method.—After having located the ureteral orifice, a sterile glove is slipped on the examiner's right hand by an assistant, who supports the tail of the catheter while the examiner guides the tip through the lumen of the cystoscope into the ureteral orifice. After the tip is engaged in the ureter and as it is introduced further into the canal the stylet is withdrawn. A catheter of large size is



FIGS. 151-152.—Top and bottom view. Two-way irrigator or catheter.

more practicable used with the Kelly open cystoscope than with the Nitze or any other form of catheterizing cystoscope.

Through the open Kelly cystoscope may also be introduced ureteral catheters or bougies that have been tipped with wax; these will show the scratch-marks of ureteral calculi and are valuable as a means of diagnosis.

A diagnosis of stricture of the ureter is more easily made by the direct than by the indirect passage of bougies, as the sense of resistance is more readily perceived. Ureteral sounds of increasing size may be used for the purpose of dilating strictures of the ureter in its lower part.

Catheterization of the Ureters by the Indirect Method.—When the Nitze instrument is to be used, the examiner disinfects his hands and wears a gown and sterile rubber gloves. The cystoscope is rinsed in sterile water and dried. The ureteral catheter or catheters are threaded into the channels provided for them, the attachment for the electric current is protected by a sterile cover, and the cystoscope is introduced.

The ureteral orifice on the side to be examined is exposed and the cystoscope is maintained in that position. The ureteral catheter is now pushed through the barrel of the instrument until the point appears in the field of

vision. By means of the device provided in the instrument the tip of the catheter is directed toward the orifice and is made to engage. Still holding the cystoscope in the same position, the catheter is pushed onward as far as required (Fig. 153). The catheters used with this form of cystoscope are marked at one-centimeter intervals, so that the cystoscopist may know just how far the catheter has been inserted into the ureter. Where both ureters are to be catheterized it may be advantageous to use differently marked catheters on the two sides, so that the right does not become confused with the left.

If urine is to be collected from the catheterized ureter, the device used to direct the catheter may be turned back to the resting position; the water in

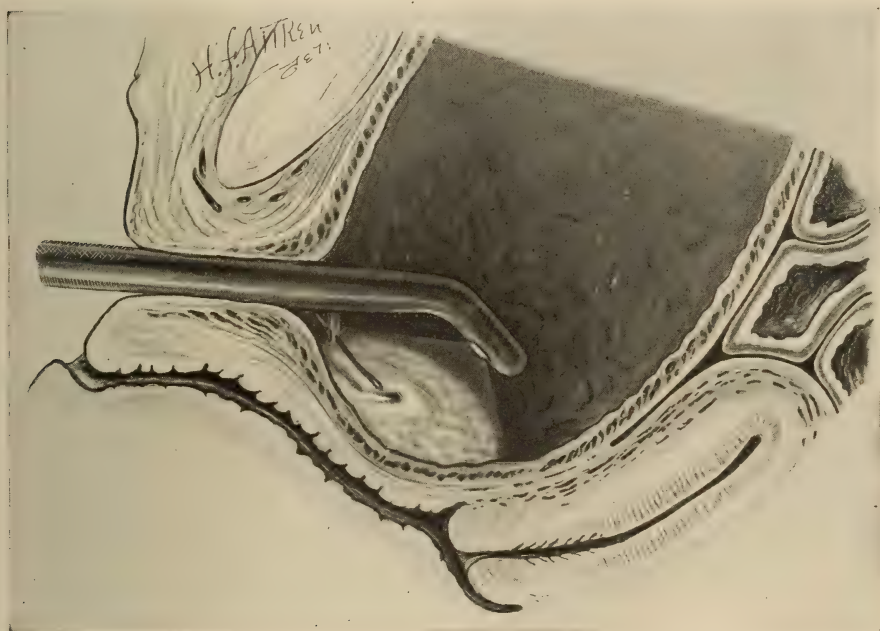


FIG. 153.—Catheterization of the ureter. The cystoscope has been rotated to illuminate the trigone, and the shutter opened to assist in directing the catheter into the ureteral orifice.

the bladder is then let out and the instrument is gently withdrawn, the ureteral catheter at the same time being pushed through the cystoscope until the tip of the latter emerges; the catheter is then caught with the fingers and fixed as the cystoscope is detached from it.

By this method obstruction of the ureter can be detected and treated. Catheters of varying sizes may be introduced in an effort to get past an obstruction or for the purpose of dilating a stricture of the ureteral orifice or lower ureter; but the maneuvers are not so satisfactory as with the direct method of cystoscopy.

In order to collect urine from one side, the catheter need not be passed for more than 5 or 6 cm.; it is unnecessary to pass the instrument further than this, for traumatism of the ureter should be kept at a minimum, lest

blood or leucocytes become mixed with the urine and impair the value of the microscopic urinalysis.

The end of the ureteral catheter should now be placed in a sterile test-tube plugged with sterile cotton; the tube should be properly supported, and the patient placed in a comfortable position. When a sufficient quantity for urinalysis has been collected, the catheter may be withdrawn.

Although it may be necessary, for diagnostic purposes, to pass the ureteral catheter into the kidney pelvis, it should be borne in mind that if the catheter is introduced so far that it doubles up in the kidney pelvis or encroaches upon the calices or pelvic walls, bleeding will almost certainly follow, and the value of the collected specimen, so far as the blood content is concerned, will be rendered void.

Under normal conditions the urine drops from the end of the catheter at intervals of from ten to fifteen seconds; two, three, or four drops follow in succession, then a pause occurs, and the dropping is repeated. If the dropping is continuous, it is an indication that the catheter has either entered a collection of fluid in the kidney, pelvis, or ureter (hydronephrosis, hydro-ureter) or that it has been drawn down into the bladder or that the rate of excretion is extraordinarily rapid as after the ingestion of a large amount of water.

At first there may be no escape of fluid from the ureteral catheter. (Care should always be exercised beforehand to see that the lumen of the catheter is unobstructed.) If the catheter has been previously tested, it may be that the eye of the instrument has become plugged with pus or blood. Under these conditions a few centimeters of sterile water may be injected through the catheter in order to dislodge the obstruction. A reflex anuria is sometimes observed. This rarely lasts for more than a few minutes—at most, five or ten.

Examination of the Ureter and Kidney by Means of a Wax-tipped Bougie.—The passage of a wax-tipped bougie through the ureter into the kidney pelvis is a valuable diagnostic means in cases of ureteral or renal calculus. Kelly uses a renal bougie 2 mm. in diameter, with an olive point 3 by 2 mm., notched on two sides, the notch running lengthwise. Two parts of dental wax and one part of olive oil are melted together and the end of the catheter is dipped in the hot mixture and allowed to harden in the air. The wax gives the catheter a highly-polished surface, which is exceedingly sensitive, and becomes abraded by the slightest contact with a hard, rough substance. In order to ascertain the exact position of the stone, whether it is located in the ureter or in the kidney, it may be advisable to coat the entire length of the bougie. A stone that is low in the ureter produces a long, continuous scratch along the extent of the catheter. The chief source of error in interpreting the marks on the wax is that they are apt to be confused with the scratches occasioned by contact with the cystoscope. (See Chapter XXV for the method of using wax-tipped catheters with the water cystoscope.)

Kelly reports eighteen cases of kidney stone in which a positive diagnosis was made by means of the wax-tipped catheter, and in which a subsequent nephrolithotomy confirmed the diagnosis. In two cases in which stones were present the waxed catheter gave no evidence of their existence.

Kelly states that the wax-tipped catheter may fail to locate a renal calculus if the pelvis of the kidney is greatly dilated and if the stone is small, if the calculi are lodged in cavities in the substance of the kidney, or if a large stone has fixed the pelvis of the kidney and the catheter pushes out the upper end of the ureter until it forms a small pocket.



FIG. 154.—Röntgenogram of ureteral stone.

In doubtful cases, when the suffering is protracted and tends to cripple the patient, an exploratory incision for confirming the diagnosis of renal calculus is justifiable.

Röntgenographic Examination of the Kidney.—Röntgenographic examination of the kidney is of value, especially in the diagnosis of renal calculus.

According to Henry Pancoast, "the röntgenographic examination is the most uniformly accurate, and, therefore, the most valuable method at our command in the diagnosis of renal calculus, provided it is employed intelli-



FIG. 155.—Shadows cast by vermiform concretion and by phlebolith; upper shadow upon the iliac crest is cast by a fecal concretion in appendix, small round shadow in pelvic area is a phlebolith. (After Fenwick, from Kelly and Burnham: "Diseases of Kidney, Ureter and Bladder," D. Appleton & Co.)

gently. The röntgenographic findings cannot of themselves, however, be accepted as absolute in every case, because of the possible existence of certain sources of error, which, though comparatively rare, must not be overlooked. Therefore, this method of examination should always be used

in conjunction with the other clinical methods of diagnosis and the symptoms which in the first place suggest the examination. The percentage of error in diagnosis of renal and ureteral stone is variously placed at from four to ten (Fig. 154).

"The degree of error possible in any individual case may be more or less approximately determined by consideration of the following four definite factors concerned in the accuracy of the results of the röntgenographic examination for renal calculus: (1) The making of the röntgenogram; (2) the interpretation of the röntgenogram; (3) anatomic difficulties; (4) other conditions or objects, normal or pathologic, which may be capable of simulating the röntgenographic appearance of calculus.



FIG. 156.—Röntgenogram of suspected renal calculus with sound in ureter. The arrow points to a shadow which was shown to lie outside of the ureter by a shadowgraph bougie. The shadow proved to be a patch in an atheromatous artery. (After Fenwick.) From Eisendrath's "Surgical Diagnosis." (W. B. Saunders & Co.)

"In connection with the first factor we may consider the skill and experience of the röntgenologist, the efficiency of his apparatus, and the preliminary preparation of the patient. As a rule, no röntgenogram should be accepted as of value for the diagnosis of renal calculus unless the intestinal tract of the patient has previously been thoroughly emptied of fecal matter by mild but efficient purgation. The stomach also should be empty, especially when the left kidney is suspected. The röntgenologist should be certain that there is no possibility of pills or foreign bodies of any kind being present in any part of the gastro-intestinal tract.

"An accurate interpretation of the röntgenogram requires equally as

much skill and experience as does the examination itself. The examination is essentially a consultation; therefore the röntgenologist must possess a reasonable amount of knowledge of anatomy and surgery; and, likewise, the surgeon should possess a corresponding degree of skill and experience in interpreting röntgenograms of this kind.

"The anatomic difficulties likely to influence the accuracy of the examination are an excessive amount of fat in the abdominal walls or omentum, thick muscular walls, tumors, and ascites. A reliable röntgenogram of the kidney area should show at least the shadows of the psoas and

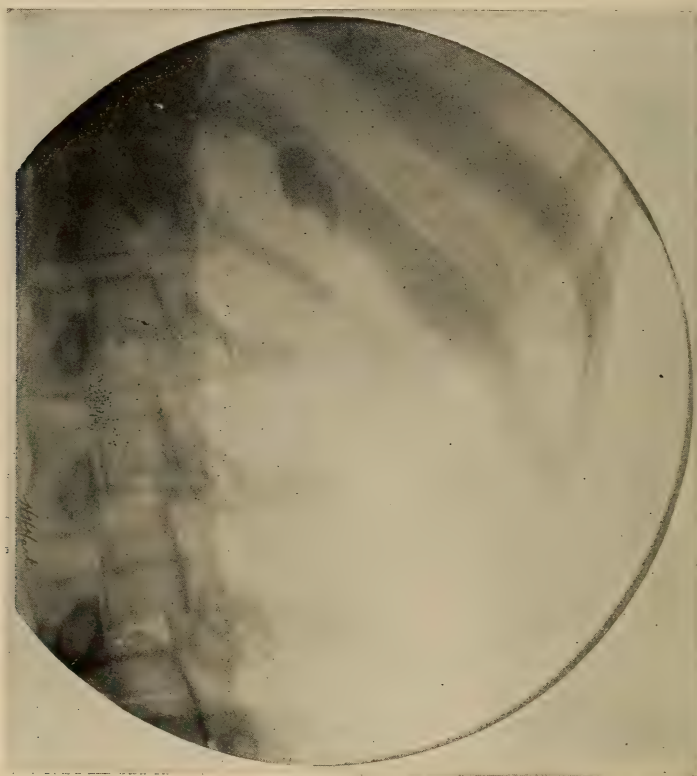


FIG. 157.—Röntgenogram showing stone in upper calyx of right kidney. Note outline of kidney and relation of stone to short twelfth rib. (Kelly and Burnham, "Diseases of Kidney, Ureter and Bladder." D. Appleton & Co.)

quadratus muscles, and, to be accurate, the shadows of the kidneys in addition. If the result of an examination is positive as to stone, it should be repeated before any operation is performed. Two negatives made at the same visit will not answer: the two examinations should be made on different days.

"A röntgenogram is a shadow picture, and unfortunately there may be present somewhere between the Röntgen ray tube and the plate other objects, normal or abnormal, which are capable of making a shadow similar to that of a calculus. This must be classed as an unavoidable source of error, though the degree of error may be more or less modified by the skill and experi-

ence of the röntgenologist. The most frequent examples of objects in the abdominal cavity which may produce misleading shadows are calcified lymph-glands, gas and fecal matter remaining in the intestinal tract due to careless preparation, pills or tablets not broken up or dissolved, fecal concretions, especially in the appendix, and collections of pus in the kidneys (Figs. 155, 156, 157 and 158). A mole on the back may cast a shadow of sufficient density to simulate a calculus. In the pelvis one may be easily misled by the frequent occurrence of shadows due to phleboliths in the pelvic veins, intestinal contents and calcified lymph-glands."

Kummell secured perfect Röntgen ray pictures of calculi in sixty-five out of eighty-four cases that came to operation. An equally large number of other kidney affections that simulated calculus were operated upon but failed to yield positive Röntgen ray findings. To arrive at a positive diagnosis, several skiagraphs must be made, and each plate must show the calculus to be in the same position. Kummell regards this constancy of position as most important in the differential diagnosis, and regards it as a characteristic sign of stone. As a rule, the calculus occupies a position on the Röntgen ray plate several centimeters from the spinal column and a little below the twelfth rib, corresponding to the anatomic position of the pelvis of the kidney. This is about the point where an imaginary horizontal line drawn through the body of the second lumbar vertebra would meet the twelfth rib. When renal calculus complicates pyonephrosis, a greater variation in the position occurs, because such stones sink into the dilated and altered pelvis and grow like coral branches into the enlarged calyces. The resulting dentate mass presents a more or less characteristic appearance that differentiates it from intestinal contents and from other foreign confusing elements. The diagnosis of renal calculus by means of the Röntgen ray is made with difficulty in very stout subjects. This difficulty may be overcome partly by compressing the abdominal wall at the time the picture is taken. Pure phosphatic stones, being soft, very often give no shadow.

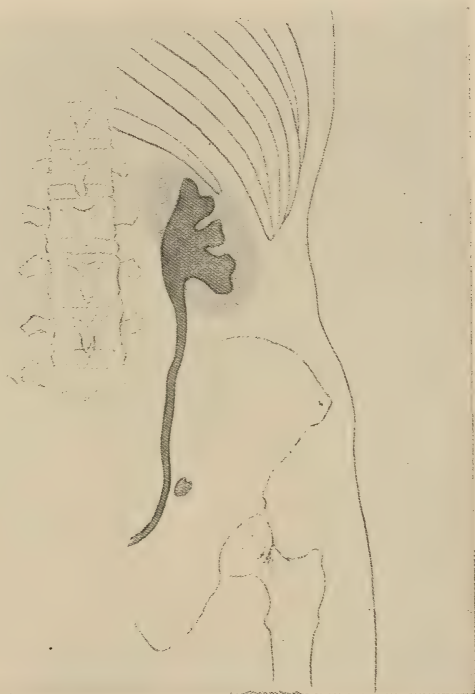


FIG. 158.—History in this case indicated ureteral calculus. A small cystic mass lay to the side of the uterus and the röntgenogram showed a shadow along the course of the ureter. Pyelography demonstrated a normal pelvis and ureter and an extraureteral shadow which operation proved to be a tooth in a dermoid cyst. (Keene and Pancoast). (Courtesy *Journal American Med. Assoc.*)

DIAGNOSTIC METHODS COMBINING URETERAL CATHETERIZATION AND
THE RÖNTGEN RAY

Shadow Catheters.—Although the Röntgen ray is the most valuable method at our disposal in the diagnosis of ureteral calculus, shadows due to other foreign bodies, as, *e.g.*, phleboliths, calcareous lymph-nodes, etc., may lie directly along the course of the ureter and lead to confusion (Figs. 156 and 158). To determine positively whether the shadow is due to a body within the ureter or external to it the suspected side should be catheterized, the catheter being impregnated with bismuth or some other substance that is impervious to the Röntgen ray. The juxtaposition of the catheter and the calculus may then be demonstrated; or a stereoscopic Röntgen ray picture may be taken. The shadow catheter plus the Röntgen ray may be of value also in identifying renal calculi.

Pyelography.—Another diagnostic method is that known as pyelography. It combines ureteral catheterization, injection into the ureter and kidney pelvis of a fluid that is impervious to the ray, and a Röntgen ray picture. It is one of the most recently devised and most valuable methods. The technic of injection is as follows: A catheter is passed into the ureter of the suspected side.² The cystoscope and catheter are maintained in a fixed position while a Röntgen ray plate is placed under the patient and the skiagrapher prepares to take the picture. A 25 per cent. solution of sodium bromide, a 10 to 15 per cent. solution of thorium nitrate,³ or a 10 per cent. solution of collargol (colloidal silver) is placed in a burette and is then allowed to run very slowly into the catheter until the patient complains of a sensation of fullness in the kidney or the flow ceases; at this instant the skiagraph is taken. The burette is now detached and the catheter left in position until the solution drains away.

By means of pyelography the actual outlines of the renal pelvis and the ureter are shown. To interpret a pyelograph, the examiner must be familiar with the shadow of the normal pelvis and ureter, and with the variations in size and shape that occur in health. Surgical diseases of the kidney and ureter frequently produce modifications of the normal contour of the kidney pelvis and ureter, so that pyelography becomes a valuable aid to diagnosis.

Pyelography is by far the best method of diagnosing hydronephrosis, particularly of the intermittent type. In diagnosing hydronephrosis by measuring the quantity of urine in the hydronephrotic sac, or by injecting the sac until the patient complains of pain, the sources of error are too evident to need elaboration. It may, however, be pointed out that a reflex

² For details of pyelography see Keene and Pancoast's paper, Jour. Amer. Med. Assoc., 1914, lxiii, p. 523.

³ Burns' method of preparing the thorium nitrate solution is as follows: "To make 100 c.c. of a 10 per cent. solution, 10 grains of thorium nitrate are dissolved in as little distilled water as possible; to this solution, kept hot on a water- or steam-bath, are added 30 c.c. of a 50 per cent. solution of sodium citrate, the additions being made in small quantities, care being taken to shake the solution thoroughly after each addition. At first, after the addition of the citrate solution, a white, gummy precipitate is formed, which later becomes granular, but finally dissolves on the addition of all the citrate solution. This solution is then made neutral to litmus by the careful addition of a normal solution of sodium hydroxid and made up to the required volume of 100 c.c. with distilled water. Upon filtration a clear, limpid solution is obtained which is not affected in the least by sterilization."

polyuria may be induced at the time of catheterization, and that the hydronephrotic sac may be partially filled or entirely empty at the time of injection. These sources of error may all be overcome by the pyelograph.

If the presence of a stone is suspected, a picture should be taken prior to making the collargol injection, since the pyelograph may obscure the shadow cast by the stone. A stone within the ureter may sometimes be brought out with greater distinctness by the addition of the shadow of the pyelograph to the shadow of the stone (Fig. 159). It may also serve to demonstrate that the shadow is that of a stone within the ureter, rather than a phlebolith or other foreign body on the exterior, by reason of the fact that the ureter around and above the stone will show dilatation.

Pyelography often discloses perfectly the kink in the ureter produced by dislocation of the kidney downward (Fig. 160). A picture is first taken with the patient in the recumbent posture, followed by one with the patient standing upright after she has been directed to breathe deeply and the kidney has been dislocated downward.

A pyelograph may also reveal distortion of the kidney pelvis or calyces, as in the case of renal tumors or congenital cystic disease of the kidney (Figs. 159 and 160).

Pyelography is a method to be used only by those who are thoroughly familiar with cystoscopy and ureteral catheterization, since there is great danger of injecting the kidney pelvis to the degree of excessive tension. Under the latter circumstances death has resulted.

Death following pyelography has been ascribed to shock, colloidal silver poisoning, colloidal silver embolism, rupture of a hydronephrotic sac, and rupture of the kidney pelvis with hemorrhage.

In most of the fatal cases reported the quantity of solution used exceeded the capacity of the kidney pelvis and had been injected with a hand syringe; or the solution used was of such a strength as to be chemically irritating.⁴



FIG. 159.—The röntgenogram failed to demonstrate a calculus. The catheter met an obstruction 13 cm. from the ureteral orifice. By means of a collargol injection, the calculus was clearly defined together with a hydroureter and hydronephrosis. (Keene and Pancoast). (Courtesy *Journal Amer. Med. Assoc.*)

⁴ Manges observes the kidney through a fluoroscope during the injection of the opaque solution; this shows the position of the kidney, and whether or not the solution has reached the pelvis.

Collargol, which was used by a majority of the investigators in the early days of pyelography, has been largely supplanted by the less irritating sodium bromide and thorium nitrate solutions suggested by Braasch and by Burns.

Estimating the Functional Activity of the Kidneys—Combined and Separate.—The amount of urine excreted from each ureteral orifice may be estimated roughly by observing the frequency of the ejections. The actual amount excreted from either kidney during a given time may be determined accurately by catheterizing the ureter and collecting the urine.



FIG. 160.—Ptosis of the left kidney with hydronephrosis. The catheter met an obstruction 4 cm. from the ureteral orifice. Pyelography demonstrated the kink in the upper ureter and the distention of the kidney pelvis and calyces. (Keene and Pancoast.) (Courtesy *Journal Amer. Med. Assoc.*)

The total quantity collected from one ureter during a given portion of time will be an index to the activity of the corresponding kidney from which an estimate for the entire twenty-four hours may be made, provided the ingestion of solids and fluids is maintained at stated intervals and in equal quantities.

Chromo-cystoscopy.—

Since catheterization of the ureters may be painful and is often undesirable or even absolutely contraindicated, the method known as chromo-cystoscopy may be employed, and will serve as a useful substitute in estimating the functional activity of the individual kidneys. This method is based on the fact that if a given amount of coloring matter dissolved in water is injected into the subcutaneous connective tissue, it will be absorbed into

the circulation and be eliminated by the kidneys within a specified time and to a certain degree in health. The length of time required for the coloring matter to appear and the degree to which it tinges the urine are dependent upon the activity of the kidneys.

Indigo-carmin.—Although other dyes have been used for this purpose, that which has proved most satisfactory is indigo-carmin.

Chromo-cystoscopy not only gives an indication as to the total renal activity, but it also enables a fairly accurate comparison of the two sides to be made. It serves as a means for locating the ureteral orifices for the beginner, or for the expert as well when the orifices are hidden and difficult to find.

Chromo-ureteroscopy.—The technic of this method is as follows: The patient is placed upon the examining table, and the external genitalia and buttocks are washed with green soap and warm water, followed by a 1:1000 bichloride solution. The bladder is now irrigated, and the cystoscopic instrument prepared for the examination. A solution of indigo-carmin, consisting of 8 cg. of indigo-carmin and 10 cg. of sodium chloride dissolved in 20 c.c. of water and sterilized, is now injected into the gluteal muscles of one side. The injection is made with a fine needle, and as soon as the needle is withdrawn the point of injection is covered with an alcohol compress. The cystoscopic examination is begun, the ureteral orifices located and carefully observed, the cystoscope being turned first to one ureter and then to the other. The bladder must be well illuminated.

Deductions as to the condition of the kidney are made from two facts: First, the time that elapses between the injection and the instant when the indigo-carmin first appears at the ureteral orifices; and, secondly, the intensity of color that the dye lends to the urine. Indigo-carmin is eliminated by normally functioning kidneys in from three to twenty minutes. The color at first may be a light blue, but it soon becomes darker. In 90 per cent. of kidneys the color appears either as a light or a dark blue within fifteen minutes; in 61 per cent., within ten minutes. If the urine does not take on a light blue color at the expiration of fifteen minutes, or a dark blue at the expiration of twenty, serious insufficiency of the renal function is present. If no elimination occurs, either the respective kidney or ureter is gravely diseased or the ureter is obstructed. The indigo-carmin test takes the place of the ureteral catheter in a large number of instances. It reveals clearly obstruction of the ureter of a particular side, or a deficiency in the secreting power of a diseased organ, but, of course, it does not differentiate between them. Error in the deductions made from the indigo-carmin test may arise as a result of a temporary reduction in the ingestion of fluids, with its consequent effect on the rapidity of excretion and dilution of the urine. This may be avoided by routinely directing the patient to drink two glasses of water immediately preceding the examination. If the solution of indigo-carmin is not accurately prepared, too much or too little of the dye may find its way into the blood. Great care should, therefore, be exercised to use the exact amount prescribed.

If the injection is not made sufficiently deep and into a muscle, absorption of the dye may be delayed. When it is especially desirable to avoid any error in this regard the injection should be made intravenously.

Phenolsulphonephthalein.—Another method of estimating the functional activity of the kidney is by the injection intramuscularly or intravenously of phenolsulphonephthalein (1 c.c. of a solution containing 6 mg. of the drug). Healthy kidneys will eliminate 60 per cent. of the drug within two hours; its presence in the urine may be detected by rendering the urine alkaline by the addition of a few drops of a 25 per cent. solution of sodium hydroxide, which brings out the carmine color. The percentage of elimination is then estimated by comparing the shade of the urine with a standard color control in the Duboscq colorimeter, or by comparing the color with a series of solutions of known percentage.

The phenolsulphonephthalein method is one of limited value in estimating the function of a particular kidney. This is due to the fact that the naked eye observing the ureteral orifice is, of course, unable to detect the exact time at which elimination begins or to make any estimate of the amount excreted. The urine must be rendered alkaline in order to bring out the color. The kidneys may be tested separately by catheterizing both sides and allowing the ends of the ureteral catheters to empty into a test-tube containing sodium hydroxide. The disadvantage of this latter method is, however, apparent at once.

The particular advantage of the phenolsulphonephthalein test is that the injection is practically painless, no more than 1 cm. of the solution being used, and that it is exceedingly reliable as a means of diagnosing the total or combined efficiency of both kidneys. In employing the test for this purpose the patient is directed to drink from 600 to 800 c.c. of water. One c.c. of a solution containing 6 mg. of the drug is then injected subcutaneously and the bladder immediately emptied by catheterization. At the end of an hour the bladder is again emptied by means of a catheter, the urine rendered alkaline, and the percentage of elimination estimated. At the end of the second hour the patient is again catheterized and an estimation is made of the second specimen. If the total elimination for two hours does not reach 60 per cent., this is evidence that the combined excretory power of the kidneys is deficient.

That the phenolsulphonephthalein test is valuable used in conjunction with the indigo-carmin test is plainly evident; for example, if the indigo-carmin test has shown that one kidney is inactive, a normal elimination of phenolsulphonephthalein will indicate that the other kidney is functionally sufficient.

The Blood Urea Test.—An estimate of the functional capacity of the kidneys is afforded by a method for determining the blood content of certain of the end-products of protein metabolism; for example, of the total non-protein nitrogen, or of one of the following constituents: Urea, creatinin, uric acid. Of these, the blood urea test seems to be the most satisfactory.

The amount of urea in the blood of a normal individual under ordinary conditions of life does not exceed about 35 mgm. per 100 c.c. If the function of the kidneys becomes impaired, the amount of blood urea increases in proportion to the degree of insufficiency. A blood-urea content of over 200 mgm. per 100 c.c. with few exceptions portends the early death of the patient.

Methods for Determining Blood Urea.—The method most generally employed is that of Van Slyke and Cullen, or one of the newer modifications that are constantly appearing in the literature. Because of the frequent changes suggested in the technic of this test and of the other blood chemical tests, in the selection of the method the student must be guided by the current literature. As a rule, 5 c.c. of blood removed from a vein suffice for the test.

BIBLIOGRAPHY

- ALBARRAN: Exploration des fonctions renales. Paris, 1905.
- BRAASCH, W. F.: Pyelography. Saunders, Phila., 1915. *Ibid.*: "Clinical Data of Nephrolithiasis." *Sur., Gyn. and Obst.*, 1917, vol. xxiv, No. 1, p. 8. *Ibid.*: "Recent Observations in Cystoscopic Technic." *Annals of Surgery*, 1917, vol. lxxv, p. 615.
- BRAASCH, W. F., AND WILDNER, F. S.: "Pyelography." *Int. Abst. of Sur.*, Feb., 1915, p. 117.
- BURNS, E.: "Thorium—A New Agent for Pyelography." *J. H. H. Bull.*, 1916, vol. xxvii, p. 157. *Ibid.*: "The Use of Thorium in Urology and Röntgenology." *Amer. Jour. Röntgenology*, 1916, vol. iii, p. 482. *Ibid.*: "Thorium—A New Agent for Pyelography." *J. A. M. A.*, 1915, vol. lxiv, p. 2126.
- CASPER AND RICHTER: Funktionelle Nierendiagnostik. Berlin, 1901.
- CLARK, J. G., AND KEENE, F. E.: "The Relationship Between the Urinary System and Diseases of the Female Pelvic Organs." *Surg., Gynec. and Obst.*, 1914, vol. xviii, p. 10.
- DOWDALL, G. G.: "Five Diagnostic Methods of John B. Murphy of Chicago." *Arch. of Diag.*, 1910, vol. iii, p. 18.
- EISENDRATH, D.: "The Effect of Injecting Collargol into the Renal Pelvis." *Jour. Am. Med. Asso.*, 1914, vol. lxii, p. 1392.
- GOLDBERG, B.: "Über das Verhältniss von Eiweissgehalt und Eitergehalt in Urinen." *Centralbl. f. d. med. Wissensch.*, 1893, vol. xxxi, p. 593.
- HUNNER, G. L.: "The Mensuration and Capacity of the Female Bladder." *J. H. H. Bull.*, No. 105, Dec., 1899. *Ibid.*: "Forcible Dilatation of the Kidney Pelvis as a Means of Diagnosis." *Surg., Gyn. and Obs.*, May, 1910, pp. 485-493. *Ibid.*: "The Significance of the Urinary Examination in Women." *Amer. Medicine*, vol. ix, No. 14, pp. 559-562, April 8, 1905.
- KELLY, H. A.: "My Experiences with the Renal Catheter as a Means of Detecting Renal and Ureteral Calculi." *Am. Jour. Urol.*, 1904, i, 14.
- KEENE, F. E., AND PANCOAST, H. K.: "The Present Status of Pyelography." *Jour. Am. Med. Assn.*, 1914, vol. lxiii, p. 523.
- KELLY AND BURNHAM: Diseases of the Kidney, Ureters and Bladder. Appleton, New York, 1914.
- KELLY, H. A., AND LEWIS, R. M.: "Silver Iodide Emulsion—A New Medium for Skiagraphy of the Urinary Tract." *Surg., Gyn. and Obst.*, 1913, vol. xvi, p. 707.
- KEYES, E. L., AND MOHAN, H.: "The Damage Done by Pyelography." *Amer. Jour. Med. Sci.*, 1915, vol. cxlix, p. 30.
- KUMMELL, H.: "Modern Surgery of the Kidney: The Achievements of Modern Surgery of the Kidney from the Standpoint of Diagnosis and Therapeutics." *Surg., Gyn. and Obst.*, 1907, vol. iv, p. 21. *Ibid.*: "Über moderne Nieren-Chirurgie, ihre Diagnose und Resultate." *Berl. klin. Wehnschr.*, 1906, vol. xliii, 901; 952.
- PILCHER, P. M.: Practical Cystoscopy. Saunders, Phila., 1915.
- ROWNTREE, L. G., AND GERAGHTY, T. G.: "An Experimental and Clinical Study of the Functional Activity of the Kidneys by Means of Phenolsulphonephthalein." *J. Pharmacol. and Exper. Therap.*, 1910, vol. ii, p. 579.
- THOMAS, B. A.: "Chromo-cystoscopy in Functional Renal Diagnosis Based upon the Employment of Indigocarmin." *Penn. Med. Jour.*, Sept., 1909. *Ibid.*: "Diagnosis of Renal Diseases and Sufficiency." *Annals of Surgery*, April, 1908. *Ibid.*: "Über die Chromo-ureteroskopie in der funktionellen Nierendiagnostik." *Zeit. f. Urologie*, 1911, Band V. *Ibid.*: "The Results of Two Hundred Chromo-ureteroscopies Employing Indigocarmin as a Functional Kidney Test." *J. A. M. A.*, Jan. 18, 1913, vol. lx, pp. 185-188. *Ibid.*: "The Quantitative Determination of Functional Renal Sufficiency by the Duboscq Colorometer; Indigocarmin *versus* Phenolsulphonephthalein." *Amer. Jour. Med. Sci.*, Sept., 1911. *Ibid.*: "The Relative Value of the Various Methods for the Determination of Functional Kidney Sufficiency." *Penna. Med. Jour.*, Feb., 1911. *Ibid.*: "The Value of Chromo-ureteroscopy in Functional Kidney Diagnosis." *Surg., Gyn. and Obst.*, April, 1911, pp. 345-353.
- VOELCKER, F.: Diagnose der chirurgischen Nierenkrankungen unter Vertwertung der Chromo-cystoskopie. 1906, Wiesbaden.
- YOUNG, E. L.: "A New Preparation for Pyelography." *Boston Med. and Surg. Asso.*, 1915, vol. clxxii, p. 539.

CHAPTER X

EXAMINATION OF THE ANUS AND RECTUM

AN examination of the anus and the rectum forms a valuable addition to the gynecologic examination, and should never be omitted when any symptoms directly referable to these parts are present. If the rectum calls for special attention, the initial rectal examination should not be made until several hours after defecation has occurred. In this way the examiner may detect

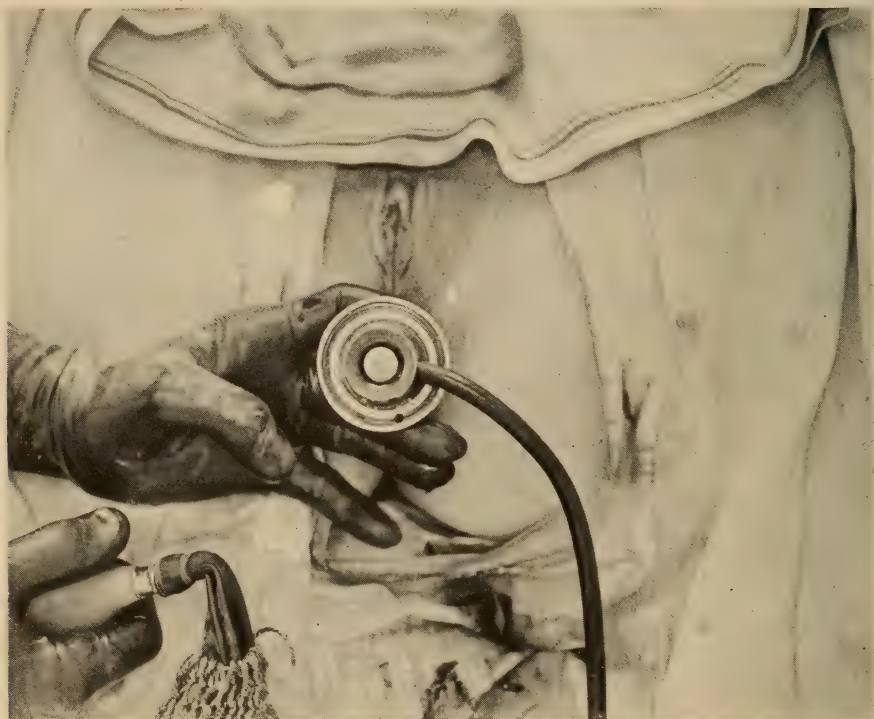


FIG. 161.—Examination of rectum—patient in dorsal position, with Tuttle's pneumatic speculum.

the presence of any abnormal discharge. Ordinarily anal and rectal examinations are facilitated by giving the patient a preparatory enema.

In making the examination the patient should be placed in the ordinary dorsal or Sims' position (Figs. 160 and 161). Simple inspection will reveal: The outlines of the external sphincter; whether the anus is well tucked up or protruding; the existence of a mucous, purulent, or bloody discharge; the color of the mucosa and of its surrounding integument, and the presence of external hemorrhoids, scars, ulcerations, or fistulous openings.

Palpation will disclose the presence of tenderness and induration suggestive of fissure, fistula, or perirectal inflammation. A fine silver probe

should be inserted lightly into any pits, fissures, or adventitious openings that may be present, for only in this way can some fistulas be detected.

The buttocks may now be well separated and the patient directed to strain slightly, thus exposing the greater part of the anal canal (Fig. 162). Dryness and desquamation of the anal mucosa, swelling and inflammation of the anal folds, fissure, anal polypus, and hemorrhoids will be at once revealed.

To the trained examining finger an anal examination will yield valuable information. The examiner's hand should be protected by a rubber glove; the finger should be well lubricated and introduced very slowly, and with a boring motion. The irritability of the sphincter muscle, as well as its size, tonicity, and sensitiveness should be noted. After passing the external sphincter, the finger should be swept around the anal canal, palpating the crypts of Morgagni and the pillars of Glisson, to ascertain the presence of ulcers or hypertrophied papillæ, small indurated areas suggestive of a blind internal fistula, or larger areas of induration or fluctuation indicative of perirectal inflammation or abscess.

Unless their connective tissue is hypertrophied, internal hemorrhoids cannot be felt. The practiced finger will detect an unnatural dryness or roughness of the mucosa, ulcers, polypi, tumors, strictures, foreign bodies, prolapse, and inflammation. Before withdrawing the finger from the rectum the coccyx should be palpated between the finger and the thumb externally, moving the structure backward and forward in order to detect the presence of fracture, dislocation, or un-



FIG. 162.—Examination of anus, buttocks separated.

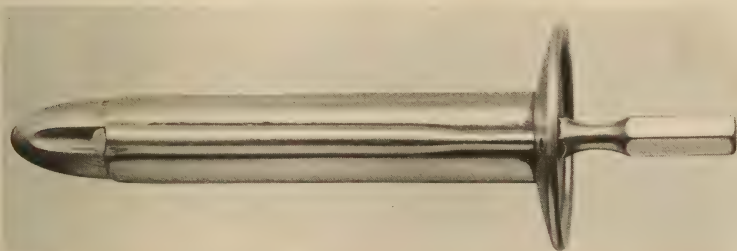


FIG. 163.—Tuttle's pneumatic speculum.

usual sensitiveness. As the finger is withdrawn the patient is directed to bear down. This will frequently cause internal hemorrhoids to protrude from the anus, and any blood, mucus, or pus in the rectum will thus be discharged.

Instrumental examination of the rectum is accomplished with the aid of certain specula. For inspecting the anus itself the bivalve speculum devised by Tuttle is most satisfactory. Tuttle recommends that a small laryn-

goscopic mirror be used in connection with this instrument, in order to obtain a good view of the mucosa covering the upper surface of the internal sphincter and the lower part of the rectum.

For examinations of the rectum and the sigmoid flexure the tubular specula, fashioned after the instruments devised by Kelly (Fig. 164) are of most value. When they are to be used the patient should be placed in the knee-chest position (Fig. 165). With a little practice the entire length of the rectum and a part of the sigmoid flexure will be open to inspection.

The pneumatic proctoscope facilitates the rectal examination, since the

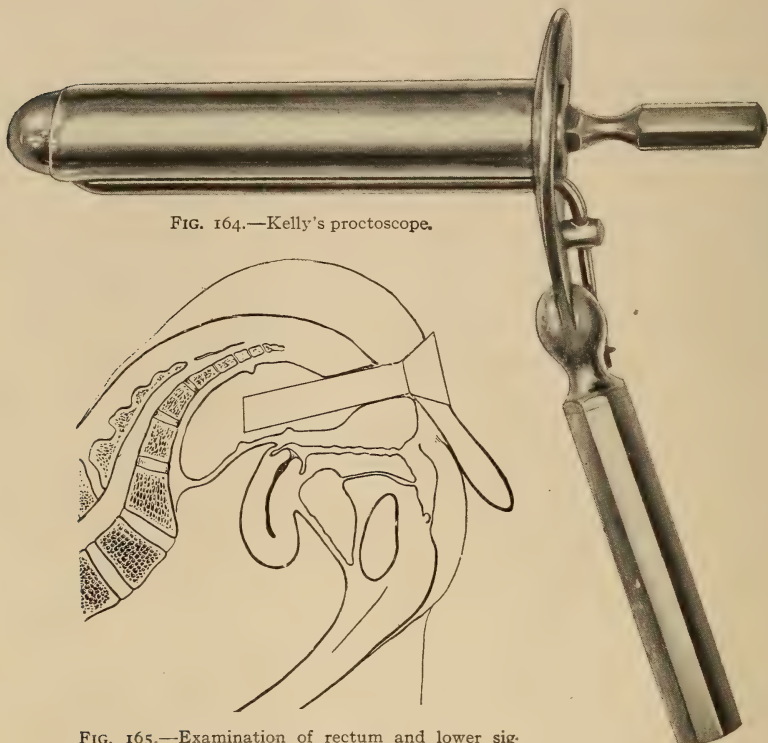


FIG. 164.—Kelly's proctoscope.

FIG. 165.—Examination of rectum and lower sigmoid with proctoscope.

patient may assume the dorsal or Sims' position. With the longest instruments of this type the entire sigmoid flexure may be inspected or even the lower part of the descending colon. Ordinarily, no anæsthesia is required. This instrument gives the best and greatest degree of exposure of any form of proctoscope as yet devised.

Tuttle warns the beginner that the brilliant illumination of the parts by an electric proctoscope heightens their color and may lead to false conclusions. It is, therefore, wise, at first, to compare the findings secured by artificial light with those obtained by ordinary reflected daylight. Fogging of the window of the instrument may be prevented by heating it slightly.

If the sphincter is relaxed as the air is pumped in for the purpose of inflating the canal, air may escape around the instrument; this may be pre-

vented by applying a coil of wet cotton or gauze about the tube and pressing it firmly against the anus. Before withdrawing the instrument the glass window should be taken off and the air be permitted to escape.

Certain other instruments are useful in making anal examinations. A probe eight or ten inches long, made of pure silver, so that it can be bent in any direction without breaking, is useful in following up fistulous tracts. The instrument should have a handle that is flattened and rough on one side, so that the examiner can always determine the direction in which the end is pointing.

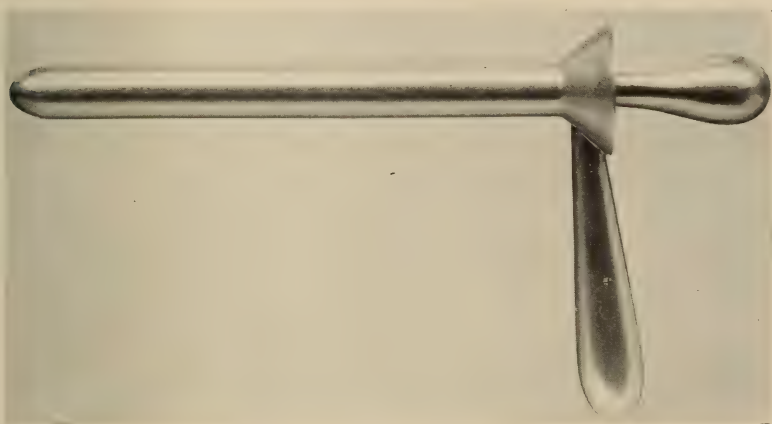


FIG. 166.—Kelly's sigmoidoscope.

An extremely fine probe is often useful in detecting blind internal fistulæ, and especially in determining the presence of diseases of the crypts of Morgagni. A small scoop made of soft copper is very serviceable for removing hard fecal masses or for freeing the mucosa or ulcerated surfaces of discharge. It is a good plan, as a rule, to have at hand a number of applicators or dressing forceps by means of which the mucosa may be cleansed with cotton.

BIBLIOGRAPHY

- ALLINGHAM, W.: *The Diagnosis and Treatment of Diseases of the Rectum*. Wood, New York, 1912, 7th ed.
EARLE, S. T.: *Diseases of the Anus, Rectum and Sigmoid*. Lippincott, Phila., 1914.
GANT, S. G.: *Diseases of the Rectum and Anus*. Davis, Phila., 1906.
PIERSOL, G. A.: *Human Anatomy*. Lippincott, Phila., 1907.
TUTTLE, J. P.: *Diseases of the Anus, Rectum and Pelvic Colon*. Appleton, New York, 1912.

CHAPTER XI

DISEASES OF THE EXTERNAL GENITALIA

Cutaneous Diseases.—Erythema and superficial dermatitis may be caused by chafing, uncleanliness, leucorrhœal discharge, irritating substances in the urine, and varicose veins.

The symptoms consist mainly of burning and itching. The skin of the vulva is reddened and usually moist, and the upper inner surface of the thighs may be affected coincidentally.

The treatment consists in removing, so far as possible, all sources of mechanical irritation; in rendering the urine bland and keeping the parts scrupulously clean, and in improving the circulation. Sedative remedies may be applied locally.

The most effectual application consists of a 5 to 10 per cent. solution of silver nitrate, followed by zinc ointment. If the patient is excessively fat, and the moisture and perspiration are very free, a dusting powder may be employed in place of the ointment. Probably the most useful combination consists of equal parts of tannic acid and lycopodium. Irritating soaps must be avoided.

Herpes.—Herpes simplex, or so-called fever blisters or cold sores, may develop at the time of each menstrual period, and have occasionally been observed after coitus. In this condition the groups of vesicles are usually bilateral. No constitutional symptoms are present, but the patient complains of soreness and itching.

The treatment of herpes consists, first, in thorough and gentle cleansing with warm water and Castile soap. The vesicles should be opened with a sterile needle and touched with a 5 to 10 per cent. solution of silver nitrate. Zinc oxide ointment or stearate of zinc in the form of a dusting powder should then be applied. Recurrent herpes of the genitalia should suggest careful inquiry into all the habits of the patient, and frequently not only extreme local cleanliness but general tonic treatment as well will be required.

PARASITIC DISEASES

Ringworm.—Ringworm involving the vulva or the inner surface of the upper thighs is best treated by local applications, three or four times daily, of liquor potassæ chlorinatæ (Javelle water). Precipitated sulphur, one-half dram to one ounce of petrolatum, may also be applied. At the outset the strength of the lotion and of the ointment must be reduced. As many of these cases are aggravated by the discharges from the genitalia, vaginal douches must be employed. Mercurial ointment, ammoniated mercurial ointment, one-half dram of each to one ounce of petrolatum or cold cream, may be used, but are generally less effectual than the others mentioned.

Pediculosis Pubis.—Under the microscope, the pediculus resembles a crab, hence the name "crab-louse" commonly applied to it. The finding of either the pediculus or its ova (nits) is diagnostic. The pediculus may be

discovered crawling over the skin surface, in the region of the genitalia, or, as is generally the case, it may be seen as a small, blackish-brown spot at the entrance of the hair-follicle, the head of the insect being buried in the root of the hair. The nits are suspended from the hair-shaft, and are either of a shiny, pearl-white, or a dull, yellowish-white hue, if the egg is dead, hatched out, or killed. Intense itching is present, and numerous scratch-marks are seen on the pubes, the lower abdomen, and the thighs. The skin not infrequently exhibits a secondary pustular infection.

The condition is best treated with an ammoniated mercurial ointment, from 30 to 40 grains to the ounce of petrolatum, or a mercury bichloride and glacial acetic acid lotion, one-quarter grain of the former and twenty minims of the latter to the ounce of water. Equal parts of alcohol, ether, and a 1 : 500 watery solution of mercury bichloride are also useful. Applications of the ointment or of the lotions should be made several times a day.

Vulvar Adhesions.—Adhesions may occur between the labia majora and the labia minora, and between the glans and the clitoris and its prepuce. These adhesions are the result either of congenital blending or of desquamative inflammation which denudes opposed surfaces and is followed by union. A great deal of importance has been attached to these adhesions in young women, in whom they are said to be a cause of masturbation. The most common adhesions are those formed between the glans and the prepuce. They should be treated by immediate separation, the glans being peeled out of the prepuce by means of a probe or a grooved director, the parts being dressed antiseptically until they have healed over without reuniting. It is probable that the importance of the condition has been somewhat exaggerated, but since a cure is so easily effected, it should never be neglected.

Vulvitis.—In the young, vulvitis is caused by epidemic gonorrhœal infection, as seen in children's homes and hospitals, or by gonorrhœal infection conveyed by the mother or the nurse, or through the medium of infected napkins, towels, etc. Thread-worms and uncleanness may be etiologic factors in the vulvitis of children. In adults the condition may be produced by repeated gonorrhœal infection, more or less constant contact of the parts with gonorrhœal pus, irritating discharges from a vesical fistula or an ulcerating carcinoma, diabetic urine, too frequent sexual intercourse, or masturbation. Streptococcus or diphtheritic infection of the vulva may occur in women during the puerperium. The rectal discharge in typhus fever and in dysentery may set up a vulvitis.

The symptoms are a sense of fullness in the affected parts, discomfort, and burning and itching. A profuse irritating discharge is present. All the symptoms are aggravated by walking.

The vulva is covered with a mucopurulent or a purulent discharge. The vulvar surface is seen to be swollen, reddened, and cedematous. In the gonorrhœal vulvitis of children, the vagina is, as a rule, affected coincidentally. In adults the urethra and the vulvovaginal glands, and often the cervix as well, are involved. The sebaceous glands of the labia majora and the labia minora may be particularly involved, the lesions resembling those of acne (follicular vulvitis), and the vulvar mucosa between the follicles presenting a normal, or at most but a slightly reddened appearance. To

determine the nature of the infection, smears and cultures should be made from the surface of the vulva, the vulvovaginal glands, and Skene's tubules. An infection in the adult involving simultaneously Skene's tubules, the vulvovaginal glands, and the cervix is almost always gonorrhœal in nature.

In the non-infectious forms cleanliness is the most important factor in the treatment. This may be maintained by means of a vulvar douche of sodium bicarbonate and sterile water (one dram to a pint), repeated several times a day. Cleanliness combined with appropriate treatment for the provocative lesions will often effect a cure. Thread-worms, diabetic urine, and irritating discharges from the rectum or vagina should be dealt with as will be described under the treatment of pruritus, page 170.

When the inflammation is the result of a Neisserian or other infection, the vulva should be kept clean by repeated vulvar douches of mercury bichloride 1:4000, or lysol 0.5 to 1 per cent. Once or twice a day, after the antiseptic douche, the parts may be washed with sterile water, carefully dried with cotton, and painted with a 25 per cent. watery solution of argyrol or a weak solution (1 to 5 per cent.) of silver nitrate. Vaginal douches must be avoided unless the cervix is involved. When there is a severe itching or burning, hot applications of lead water and laudanum or of witch-hazel should be made. As the symptoms subside 1 per cent. of powdered burnt alum may be added to the hot applications, if their use has been found necessary, or an astringent vulvar douche of zinc sulphate and alum in water (15 grains of each to 1 pint of water) may be substituted.

General measures, such as rest in bed, saline laxatives, and refrigerant diuretics, are important. The vulvar cleft should be filled with gauze or cotton, to catch the discharge and keep the inflamed surfaces apart. When there is no longer severe burning or tenderness, a stronger germicidal solution, such as silver nitrate, 5 to 10 per cent., may be applied directly to the vulva. The opposed surfaces of the vulva should be kept separated, and protected either with plain or carbolized zinc oxide ointment, or with a dusting powder consisting of equal parts of calomel and bismuth, or of equal parts of tannic acid and lycopodium.

Following gonorrhœal vulvitis infection is likely to remain in Bartholin's glands, and special attention should be given them. By means of a blunt hypodermic needle, 25 per cent. ichthyol or 25 per cent. argyrol should be injected into their ducts. Should the disease persist in spite of treatment, the glands must be laid open freely and cauterized with phenol or a hot silver probe, or dissected out entirely.

For itching, the following lotion may be used:

R. Phenolis	3j
Glycerini	f3ij
Alcoholis	f3ij
Aq. rosæ	q. s. f3iv

Or the following calamine lotion may be used:

R. Calamini	3iv
Zinc. oxidi	3iiss
Aq. calcis,	
Aq. rosæ	aa f3x.

The therapy of *gonorrhœal vulvovaginitis in infants and young children* is difficult to carry out. The child is usually terrified by any attempt at treatment, and the parts are so small and inaccessible that many mechanical difficulties are presented. If the disease is confined to the vulva, the task is less formidable, as it is limited to external applications. When the vagina also is involved—and this is usually the case—the best plan of local treatment is to administer copious douches to the vagina, carried out by means of a small, soft-rubber catheter, using a gallon of warm salt or boric acid solution (1 dram to 2 pints of water) at each application. The douche should be given by the mother or nurse as often as two or three times a day, being careful to avoid traumatism and endeavoring to gain the child's confidence. Every two or three days the cleansing douche may be supplemented by a douche of silver nitrate (1 quart) 1:1000, followed by salt solution. The keynote of the treatment is the maintenance of absolute cleanliness plus occasional douching with an antiseptic solution. Instead of silver nitrate, ichthyol (5 per cent.) may be used, or the vagina may be flooded with argyrol solution (10 per cent.) applied by means of a soft-rubber ear syringe.

The treatment of vulvovaginitis is often unsuccessful because it is inadequately carried out. The affected parts must be kept clean and free from discharge, just as in the treatment of gonococcus conjunctivitis. If a watery solution shows signs of being irritating, the antiseptic (ichthyol, argyrol) may be combined with glycerine or mineral oil.

If gonorrhœal vaccines were effectual, this would be an ideal method of treating the vulvovaginitis of children. The results are, however, only fairly satisfactory, but if the case is resistant to local treatment, vaccines should be tried. Hamilton has obtained 85 per cent. of cures with vaccines, as compared with 60 per cent. of cures effected by irrigations. He used stock vaccines, beginning with a dose of 50 million every five days, increasing the dose by 10 million at each injection. With larger doses—over 100 million—the injection is made at ten-day intervals. In acute cases six injections sufficed. Hamilton regards a case as cured when the smears are negative for gonococci for four successive weekly examinations, and for two additional examinations at intervals of two weeks.

The average time necessary to obtain a cure in eighty-four cases treated by vaccines was a little less than two months.

If there are other children in the same house or institution, complete isolation is advisable. The infected child should have its own individual nursing bottles, napkins, etc. No tub-baths should be given, and the cotton or gauze used in the treatment should be burned.

Gangrene.—Gangrene of the vulva is the result of infection with the diphtheria bacillus or the streptococcus. It occurs in weakly children or in parturient women during the course of a prolonged septic condition. It is most prone to follow in the wake of contusions, œdema, or extravasations of blood. The parts should be left undisturbed as far as is compatible with cleanliness. The general treatment is of the greatest importance. Diphtheria antitoxin or antistreptococcic serum should be prescribed.

Pruritus Vulvæ.—Pruritus, or itching of the vulva, may be produced

by an excess of certain substances in the blood, such as bile, uric acid, urea, sugar, morphine, alcohol, or iodine. It may also occur as the result of congestion or stasis of the blood-vessels of the vulva, as seen in heart disease, pregnancy, retroversion of the uterus, or uterine tumors. It may be a symptom in skin diseases, such as erythema, urticaria, herpes, eczema, and trichiasis. In carcinoma of the vulva it is an early symptom. Among the other etiologic factors are: Irritating discharges, such as hyperidrosis, diabetic or ammoniacal urine, the leucorrhœa of gonorrhœal infection of the cervix or the endometrium, carcinoma of the uterus, or decomposing fibroid tumor; rectal discharge, as in purulent and catarrhal inflammations; parasites, *e.g.*, pediculi, oxyuris vermicularis, and the leptothrix, leptomitus, and oidium albicans; heat (pruritus æstivalis) and cold (pruritus hiemalis); masturbation.

The itching of the vulva may be intense; it becomes worse at night, and under the influence of warmth and exercise; it is exaggerated also during pregnancy and at the menstrual periods. Because of an uncontrollable desire to scratch the patient avoids society and becomes depressed and nervous. Relief may be sought in drugs.

An examination of the vulvar surface usually discloses one of the local conditions just noted. Scratch-marks may be present. In old cases there is considerable thickening of the vulvar skin, which becomes leathery, and presents a dead white surface, broken here and there by the excoriations made by the patient's finger-nails. Urinalysis may disclose the presence of sugar, bile, or an excess of uric acid. In every case of pruritus it is very important to determine the underlying lesion. In the few instances in which none of the causes previously mentioned are found, the disease may be regarded as a pure neurosis.

The *treatment* of a particular case of pruritus is largely governed by the cause that produced it. Whatever method may be selected to relieve the immediate suffering, the general health should be investigated, and such disorders as diabetes and heart disease should be actively treated.

Locally the parts should be kept absolutely clean, and a sedative ointment, powder, or wash applied. If the symptoms are caused by pediculi, a solution of mercury bichloride (1:500), in equal parts of alcohol, water, and ether or mercurial ointment will give good results. Pruritus due to the itch insect may be treated with sulphur ointment (U. S. P.) or betanaphthol (35 grains to 1 ounce of lanolin).

Pruritus due to pin-worms will yield to rectal irrigations with an infusion of quassia (1 ounce to 1 pint of water), and to the fluidextract of senna and spigelia ($\frac{1}{2}$ to 1 fluidram) every four hours until a purgative effect is produced.

Pruritus caused by trichiasis, that is, the growth of short and stiff inverted hairs, should be treated by extracting the hairs with suitable forceps, or their growth should be stopped by electrolysis.

If an irritating discharge is present, a vaginal douche (sodium bicarbonate and sodium baborate, of each, a half ounce to a gallon of warm water) should be administered two or three times a day, after which the vulva

should be thoroughly dried and the vagina packed with tampons, so as to absorb any discharge that may come from the upper genital tract.

If the urine is highly concentrated, potassium citrate, in full dose, with an abundance of water, should be given; if the urine contains pus, sodium benzoate and hexamethylenamine, of each, 5 to 10 grains every three hours, combined with such measures as are necessary for the pus-producing lesions, will be efficacious.

Rectal discharges should be controlled by frequent irrigation of the rectum with normal saline solution, followed by the injection of two ounces of a 25 per cent. solution of argyrol, or of a 2 to 5 per cent. solution of silver nitrate. If the discharge comes from a lesion situated far above the anus, high irrigation of the colon and the exhibition of intestinal antiseptics must be practised.

After thorough cleansing of the vulva nothing is more soothing than the application of silver nitrate, 5 to 15 per cent., followed by the ordinary zinc ointment of the pharmacopœia (5 per cent. of phenol sometimes increases its efficiency), or a dusting powder of zinc oxide and zinc stearate may be used. Irritated surfaces must be kept apart by the interposition of cotton.

In very severe cases a strong solution of cocaine (20 per cent.) may be used, or a dusting powder of morphine (1 grain) and prepared chalk (2 grains) may be rubbed in daily; or, better still, the patient should be kept in bed and hot applications of lead water and laudanum be made.

Combinations almost innumerable have been devised to relieve the itching. In obstinate cases various preparations may be tried in the hope of finding one that will be successful. Small obtained the best results from turpentine and unguentum petrolatum (1 to 2). Montgomery recommends equal parts of alum and sugar, also chloroform in glycerin (1 to 8), or hydrocyanic acid 2 or 3 drops to the ounce of water, or 10 per cent. guaiacol in vaseline. Hirst mentions the infusion of tobacco, vinegar, vaginal suppositories of ichthyol and glycerin, the subcutaneous injection of normal salt solution (1 to 3 liters), the Röntgen ray, faradism, and the rapid interrupted galvanic and the high-frequency static current. Penrose speaks of equal parts of prepared chalk and bismuth subnitrate, or a mixture of corrosive sublimate ($\frac{1}{2}$ grain) and emulsion of bitter almonds (1 ounce). Monk states that Goulard's extract, menthol, and chloral ointment (5 to 10 per cent.) may be effectual. He also prescribes Hofmeister's emulsion:

R. Potassii bromidi	3ij
Lupulini	3ij
Hydrargyri chloridi mitis	3x
Ol. olivæ	f3xx

Dudley employs pure phenol or pure ichthyol and an ethereal solution of iodoform. Noble asserts that nothing relieves the itching of a dermatitis better than black wash and bismuth. When pruritus is a symptom of a primarily cutaneous lesion of the vulva, the disease, whether it be eczema, intertrigo, or some other skin affection, requires the same treatment as when it occurs elsewhere in the body.

In some cases pruritus cannot be ascribed to any demonstrable affection, and it may then be regarded as a neurosis and treated accordingly.

In many instances the diet will require regulation. The patient should avoid highly seasoned or nitrogenous food, as well as the prolonged use of or addiction to certain drugs, such as morphine, quinine, and iodine. Alcohol must also be forbidden.

Hyperæsthesia of the Vulva. (See Vaginismus, page 194.)



FIG. 167.—Elephantiasis of vulva. (After Allbutt, Playfair and Eden.) (McMillan & Co. Ltd.)

Kraurosis vulvæ is a rare condition, characterized by atrophy and shrinkage of the vulvar parts. It is usually preceded by obstinate pruritus. Its most common symptoms are intense itching and interference with sexual intercourse. Treatment is usually of no permanent benefit. Relief from pain and pruritus may be obtained by the use of local applications (see Pruritus). Gradual dilatation of the vaginal orifice or surgical measures to relieve the contractions are usually inadvisable.

Elephantiasis of the Vulva.—Elephantiasis is a condition of brawny œdema and hypertrophy (Fig. 167). The lesion is due to a lymphatic obstruction which may be caused by syphilis or the *filaria sanguinis hominis*. There are usually secondary infection and inflammation of an erysipelatous type. Occasionally an erysipelatous inflammation (*streptococcus erysipelatis dermatitis*) appears to be the primary lesion. Uncleanliness predisposes to the disease. The symptoms are due to mechanical irritation, and are most evident in walking and during sexual intercourse. The labia majora and minora are hypertrophied, pigmented, indurated, and cedematous.



FIG. 168.—Chancre of vaginal introitus. (University Hospital.)

Excoriations or warty outgrowths may appear upon the surface of the vulva. An offensive serous discharge is present.

The treatment is more or less unsatisfactory, unless the disease is distinctly confined to the vulva. When the latter is the case, the hypertrophied parts may be excised with as wide a margin as possible and the wound closed by plastic repair. If operation is not undertaken scrupulous cleanliness and the use of a dusting powder or a sedative ointment may help to make the patient more comfortable.

Venereal Sores.—The appearance of venereal lesions in the female differs somewhat from that in the male. Neither the chancre nor the chancroid is so constant in form. Each may be modified by the personal cleanliness of the woman and by her habits. Associated with the venereal

lesion, not infrequently there are œdema and induration of the labia majora produced by bruising of the vulvar parts during coitus and the use of strong disinfecting solutions.

Chancre.—Chancre of the vulva is so rarely observed that exact information as to its appearance is lacking. For that reason, all cases should be described minutely and note made of variations in form. The primary sore in women may be considerably modified by the personal cleanliness of the woman and her habits. The most frequent seat of chancre, it is said, is the labia majora; the fourchette, nymphæ, clitoris, and mons veneris being next in frequency in the order named.

On a skin surface as, *e.g.*, the labia majora, induration develops in about a week and is usually parchment-like. On modified skin surfaces, "near" mucous membranes, induration may be absent. The primary sore is smaller and clears up more rapidly in women than in men.

The chancre usually appears as a superficial round or oval erosion, having a dusky red areola and a purplish raw surface, in the center of which there is a gray false membrane that discharges a small quantity of sero-sanguineous fluid (Fig. 168).

The chancre often takes the form of an indurated papule. It consists of a hard, elevated, dusky red tubercle, sharply defined from the surrounding tissues, having a dry surface whose height is frequently augmented by layers of exfoliated epithelium. The chancre may be deep enough to involve the true skin or even the subcutaneous tissues (Fig. 169), and in such cases a chancrous



FIG. 169.—Gumma of vulva, with secondary infection and ulceration. (Philadelphia Hospital.)

ulcer may form; the latter may be superficial or deep, with sloping edges and covered with a gray false membrane and a sero-sanguineous discharge.

The primary sore in women probably occurs more often on the cervix than is usually believed. The diagnosis is confirmed by identification of the *treponema pallidum* in suitably stained preparations, or by means of fresh smears examined by the dark-field microscope. The Wassermann reaction is always indicated in genital lesions as an aid in diagnosis.

Secondary syphilitic lesions of the vulva are seen somewhat frequently. A papular syphilide developing upon the vulva soon exhibits an abraded and secreting surface, and may be partly or completely covered by a gray,



FIG. 170.—Condylomata lata, secondary syphilis, surrounding vulva.
(After Power and Murphy.) (Courtesy Potter & Stoughton.)

adherent, offensive pseudomembrane. This is known as a mucous patch. Sometimes the moist papule takes on a distinct papillary overgrowth (condyloma). Condylomata (Figs. 170 and 171) appear as elevated, flat, raw surfaces. The cellular infiltration is so abundant that the papillary nature of the growth is but imperfectly manifested, and can be observed only on careful inspection. When the mucous patch preceding the condyloma has developed from a large papular syphilide, the elevated surface varies in size from that of a shirt-button to a penny.

Tertiary syphilitic lesions of the vulva are rare, and usually manifest themselves in the form of gumma of the labia majora (Fig. 175). The lesion



FIG. 171.—Condylomata lata of the vulva and anus; on the latter they present a papillomatous or vegetative appearance. (After Taylor.) (Courtesy Lea & Febiger.)

shows a tendency to break down and suppurate, producing serpiginous ulcers with grayish, ragged floors.

The Treatment of Syphilitic Eruptions.—In these eruptions the general treatment is of the utmost importance, but will not be discussed here. No local treatment for chancre is absolutely necessary; if the surface is hard and indurated and fairly dry, it may be protected with a mild ointment of ammoniated mercury (20 grains to 1 ounce of zinc oxide ointment); if the surface is moist, it may be bathed with 1 : 4000 bichloride solution and dusted with equal parts of acetanilide, boric acid, and calomel. The patient should, of course, be warned of the contagious nature of the infection. Mucous patches and condylomata should be painted with silver nitrate (5 to 10 per.

cent.) and dusted with iodoform, aristol, or bismuth subiodide. One of the best local applications for condylomata is the following:

℞. Hydrarg. chloridi mitis	gr. xl
Ac. salicyl.	gr. x
Ac. boric.	gr. xxx
Pulv. alum. ex.	ʒj.

For tertiary syphilitic lesions a mild germicidal protective, consisting of either calomel or ammoniated mercury (20 grains to 1 ounce of boric acid ointment) may be applied several times daily.



FIG. 172.—Syphilis (secondary) of the vulva and anus. (Philadelphia Hospital.)

Chancroid.—Chancroids of the vulva usually affect the area immediately surrounding the vaginal orifice, but they may also occur upon the cervix. Chancroids in women are usually more extensive than in men. The ulcerations present a punched-out appearance, and the edges are undermined (Fig. 176). Secondary infections are quite common, and may be repeated indefinitely unless careful preventive measures are taken.

A chancroidal ulceration of a chancre may occur, or the chancroid and the syphilitic infection may occur coincidentally, the lesion of the first disappearing before the second one develops. When the lesions are combined, they may be indistinguishable, the only indication pointing to a chancre being the induration.

Treatment of Chancroid.—Chancroidal ulcers should be immediately cauterized with nitric acid, acid nitrate of mercury, or phenol. When the lesions are small, the previous application of cocaine may be sufficient to



FIG. 173.—Syphilis (secondary) of the vulva and anus. (Philadelphia Hospital.)

relieve pain. In extensive cases, or when the patient is nervous, nitrous oxide or a general anæsthetic must be employed. After cauterization the parts should be washed with a 1:2000 bichloride solution and a dusting powder of iodoform applied. The odor of iodoform may be disguised or kept at a minimum by carefully limiting its application to the ulcerating surfaces, or by mixing it with equal parts of powdered roasted coffee, or with 4 minims of the oil of peppermint or the oil of rose to 1 ounce of the powder. Aristol or iodol, or the preparation suggested by Knowles (calomel, 20 to 40 grains; salicylic acid, 10 to 20 grains; zinc oxide, 30 grains; and talcum, 1 ounce) may be used if it is found inexpedient to use the iodoform. The dressing should

be repeated several times a day, and the vulvar cleft kept packed with a layer of absorbent cotton held in place by a T-bandage.

After healthy granulations have appeared, a powder consisting of equal parts of acetanilide, boric acid, and calomel may be used. If the discharge is profuse, powdered tannin may be added to the dusting powder in the proportion of 1 to 4. If the granulations are exuberant, the solid stick or a strong solution of silver should be employed.

In serpiginous cases, prolonged sitz-baths, a wash of nitric acid (1 dram) and water (1 pint), or hot compresses of bichloride solution (1:5000) or of lead-water and laudanum, may be used. After healthy granulations have appeared in extensive cases, a stimulating solution of the balsam of Peru and water (1 to 8) will be found advantageous. Throughout the treatment

emphasis should be laid upon the importance of observing scrupulous cleanliness by the use of soap and water.

The general condition of the patient should receive careful attention. In these cases iron, quinine, and strychnine, and cod-liver oil are often of service.

At the first appearance of the symptoms of *bubo* the patient should be confined to bed and an ice-bag applied to the affected groin. If the patient must be about, an ointment made of equal parts of ichthyol, mercury, belladonna, and iodine should be applied to the affected region. A snug bandage should be so placed as to exert firm, equable pressure upon the in-

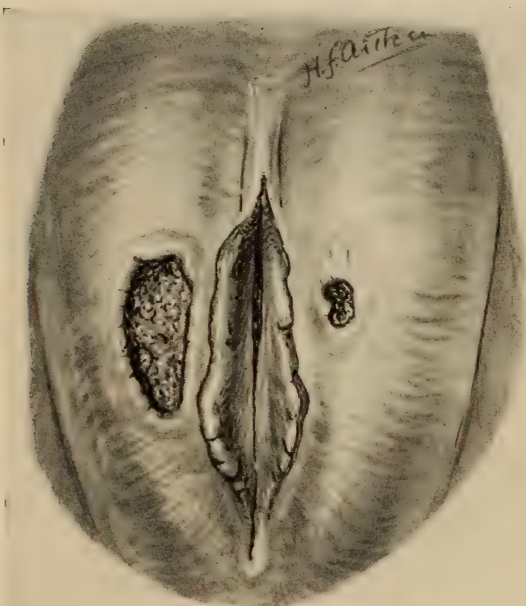


FIG. 174.—Syphilis (secondary) of the vulva and anus. (Philadelphia Hospital.)

flamed gland. If suppuration is imminent, the entire gland should be extirpated without rupture and the incision closed. If enucleation of the gland is not feasible, it should be incised, curetted, swabbed with pure phenol, and drained.

Venereal Warts (Condylomata Acuminata).—Venereal warts result from uncleanliness or from the irritation produced by gonorrhœal discharges. They are also associated at times with secondary syphilitic lesions.

Venereal warts appear in the form of papillary excrescences, either as a single discrete group or as a coalescent, cauliflower-like mass (Fig. 177). They may occur on the vulva, mons veneris, perineum, or anus, and are also occasionally found in the vaginal vault and upon the cervix. In the pregnant they grow rapidly. They usually present a purplish-red color. The surface is moist, and divided into small projections that have pointed ends (condylomata acuminata).

The symptoms range between actual discomfort and pain. Usually they simply interfere mechanically with walking or with intercourse, but when inflamed, they become painful, and at times give off a thin and highly irritating discharge.

The treatment is based on the observance of absolute cleanliness and the application of antiseptics. If the patient is syphilitic, general treatment is required. The parts should be washed frequently with bichloride (1:2000), followed by normal salt solution. After drying, a dusting powder of equal parts of tannic acid and lycopodium, or boric acid, 20 to 40 grains, calomel, 15 to 20 grains, calcium, 1 dram, may be found useful.



FIG. 175.—Gumma of the vulva, tertiary syphilis. (Philadelphia Hospital.)

Small outgrowths may be destroyed by nitric, chromic, or acetic acids or pure formalin. Before applying these remedies the surrounding skin must be protected with vaseline. The acids or the formalin should be applied with a glass pencil. Larger masses should be excised, and the wound closed with silkworm-gut sutures.

Individual warts may at times be removed by ligation with fine silk or by freezing with a spray of ethyl chloride. Associated or provocative diseases, such as syphilis, gonorrhœa, and elephantiasis, must receive suitable attention.

Œdema of the vulva occurs as the result of intrapelvic pressure from the head of the foetus, tumors, pelvic exudates, and infiltrations. It may be unilateral or bilateral, the latter being most frequently the case. It may also be part of a general œdema due to heart, kidney, or liver disease. Œdema of the vulva may be a precursor of elephantiasis, especially if the latter is also present in the lower extremities. When œdema is of long duration, hypertrophy of the cutaneous papillæ, with the formation of wart-like excrescences,

occurs. If the cause is evident, the indications are plain: The removal of pelvic tumors, the absorption of pelvic exudates, the stimulation of a failing heart, and of impaired renal or hepatic function.

Varicose Veins of the Vulva.—Pregnancy, pelvic exudates, pelvic tumors, retroposition of the uterus with adhesions, straining at stool, prolonged standing, heavy work, and circulatory weakness are among the causes of this condition. Varicosities are usually found in the labia majora, but other parts, including the vagina, may be involved.

The patient complains of itching and burning or of a sense of discomfort or weight. An elongated, knotty, bluish enlargement, made up of dilated and tortuous veins, is present. Upon palpation the mass resembles a bag of earth-worms (Fig. 178). The condition ranges from a slight distention of the vulvar veins to a tumor as large as the foetal head. The underlying or causative lesion must, if possible, be corrected. If operation is inexpedient, the enlarged veins should be supported by means of a vulvar pad. In some cases relief can be obtained only by excision. During pregnancy the patient should assume the recumbent position as frequently as possible.



FIG. 176.—Chancroid.

Hæmatoma of the vulva is caused by the subcutaneous rupturing of varicose veins from increased tension during pregnancy or labor, or as the result of direct trauma, as by a fall or a blow. It is usually unilateral (Fig. 179). The symptoms consist of sudden pain in the affected part, with rectal or vesical tenesmus. Later there is also a feeling of fullness, and if suppuration occurs, as is likely after labor, the

symptoms of abscess appear. Examination discloses a purplish, globular tumor that may be as large as the foetal head. It is tense and elastic at first, but later, as the fluid is absorbed, it becomes doughy to the touch.

During the period of active bleeding, treatment consists of rest in bed and the application of an ice-bag or a firm compress. Later hot fomentations may effect the absorption of the extravasated blood. If the hæmatoma persists, or if suppuration seems imminent or has occurred, a free incision should be made and the cavity packed with gauze and allowed to heal by granulation.

Hypertrophy of the vulva, in part or as a whole, may be a congenital or an acquired lesion. It may accompany or follow œdema, and may constitute a form of elephantiasis. It is said to affect the labia minora, par-

ticularly in patients who practice masturbation. When the latter structures alone are involved, especially if unusual pigmentation also exists, masturbation may be suspected. A colossal hypertrophy of the nymphæ is observed in some orientals, the Hottentots, and the Bushmen. This condition is known as the Hottentot apron.

Carcinoma of the Vulva.—Primary carcinoma is usually of the squamous type—epithelioma (Fig. 180). It may be preceded by kraurosis, leucoplakia vulvæ, papillomata, or some form of trauma, or there may be no prior lesion. Secondary carcinoma of the vulva results from a malignant growth higher in the genital tract, and may be of the cylindric-cell variety (adenocarcinoma). The growth begins in the sulcus between the labium majus and the nymphæ, upon the clitoris, or in the periurethral mucosa of the vestibule. It occurs with great frequency between the ages of sixty and seventy years, and is rarely seen in the young. (In 331 cases collected by Rothschild, only 11 were under thirty-one years.)

The affection first appears as a small, indurated, elevated nodule. Later inflammation and superficial ulceration occur. The surface is elevated and granular, and the adjacent tissues become thickened and indurated. The opposing surfaces of the vulva may develop a carcinomatous growth as the result of contact. Pruritus is the most common early symptom, but is not characteristic of the disease. Early subjective symptoms may be absent. Later, when infection has occurred, pain is more or less constant. At about this time the inguinal or femoral (or both) glands on the affected side become enlarged; in some cases this occurs much earlier. There is a serous, offensive discharge, and slight hemorrhage is observable. After the growth becomes extensive and ulceration has occurred the symptoms are all intensified and general ill-health and cachexia supervene.



FIG. 177.—Venereal warts.

It is important to make a diagnosis of the condition in its *earliest stage*. To this end *any suspected lesion* should be *immediately excised* and subjected to microscopic examination. It is to be differentiated from *lupus*, which appears at an earlier age, progresses very slowly, and causes but little pain (Fig. 181). Instead of single, hard nodules, as in carcinoma, there are multiple soft growths. In *lupus* the discharge is not putrid, the ulceration tends to undergo cicatrization, healthy skin is frequently found between neighboring lesions, and the inguinal glands are not, as a rule, involved.



FIG. 178.—Varicose veins of the vulva. (Kelly and Noble's Operative Gynecology. W. B. Saunders Co.)

The first step in the way of treatment in early cases consists of operation. The carcinomatous area should be excised *en bloc* with the neighboring lymphatic glands, a wide margin of healthy tissue being allowed to remain. The wound should be closed by flaps from the adjacent skin areas. If there is the least suspicion of enlargement, or in any case in which the disease is advanced or has existed for some time, the inguinal glands on both sides must be removed. In advanced cases, dissection of the entire superficial and deep inguinal and femoral lymphatic chain, by the method of Basset, as recommended by Taussig, should be adopted. The latter does this on both sides, as the first one of a two-stage operation. Two weeks later he performs excision of the vulvar tumor with the cautery knife. In

very old patients, and when surgical interference is dangerous, the Röntgen ray and radium may be used. When operation is undertaken in greatly advanced cases, supplementary treatment with the Röntgen ray or radium may be of value. (See Chapter XL.)

Sarcoma of the vulva usually affects the labia majora. It begins as a hard, round nodule that is brown or black in color (Fig. 182). It grows



FIG. 179.—Hematoma of vulva, occupying left labium majus and extending downward to perineum. Patient fell astraddle a chair. (Kelly's Operative Gynecology. D. Appleton & Co.)

rapidly and ulceration and involvement of the inguinal glands occur late. The disease is usually fatal. Death results from metastasis by way of the veins. The diagnosis can be made only from the microscopic findings. Early excision of the affected area and radium offer the only hope of cure.

Tuberculosis of the vulva (*lupus*) is a rare condition. It occurs often before puberty, but more frequently between twenty and forty, and occasionally later in life. The lesion is produced by the tubercle bacillus, and is practically always secondary to genital tuberculosis higher up or to pul-

monary tuberculosis. Early in the disease nodules, varying in size from a pinhead to a bean, are seen embedded rather deeply in the skin. They present a red, brown, or a yellow-red color. Later they enlarge and undergo cheesy or colloid degeneration. Finally ulceration takes place. The ulcers are soft and usually superficial in nature, but they may be deep, causing fistulous communications between the vagina and the surrounding parts. The ulcerated areas are the seat of bright red granulations, bleed easily, and are covered with pus which does not have an offensive odor. Cicatrization occurs irregularly, and may produce stricture or stenosis of the urethra, vagina, or rectum. There is little pain, and the growth is very slow.

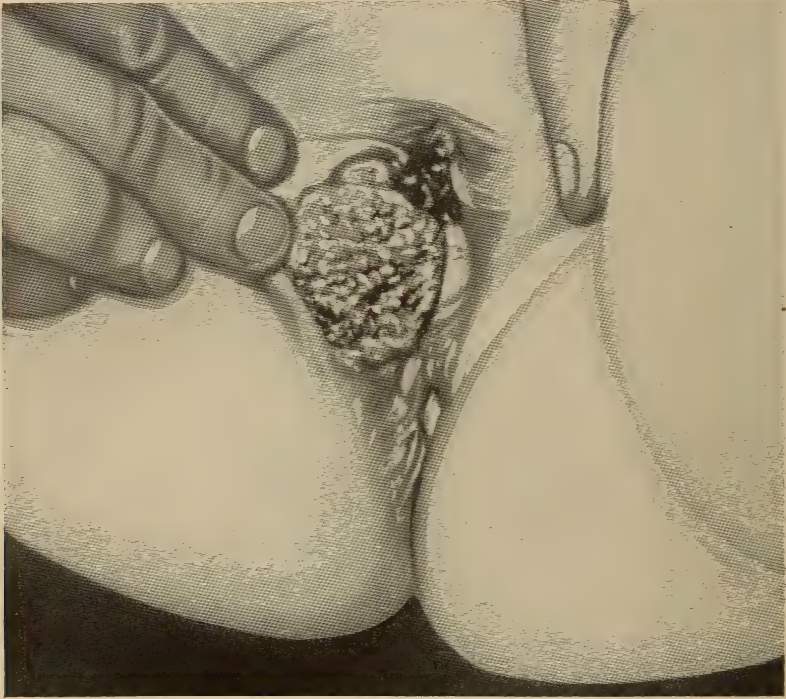


FIG. 180.—Epithelioma of vulva, indurated fungoid ulcer. (Carnett from Martin.)
(Courtesy Lea & Febiger.)

The diseased area should be cauterized thoroughly, and then excised, leaving a wide margin of healthy tissue. The Finsen rays and cauterization with caustic potash or a paste of pyrogallol (40 per cent.) may be of benefit in some cases.

Rodent ulcer is a term applied to a particular form of chronic ulceration of the vulva. It occurs especially in prostitutes, and syphilis seems to be a predisposing factor, although its active syphilitic nature is denied. In twenty cases observed by Fisichella during a period of six years, the Wassermann reaction was positive in all. The etiology and identity of this disease are somewhat shrouded in doubt, but the clinical pathologic picture described may be designated as rodent ulcer, esthiom'ene, etc. The disease

is regarded by some as identical with lupus or tuberculosis of the vulva, and in some cases tubercles have been demonstrated in the ulcers. Such instances are, however, regarded as secondary infections, since, as a rule, no specific elements of any kind can be found in the ulcerated areas.

The underlying cause of the lesion is believed to be a blocking of the lymph-channels of the vulva following extirpation or inflammation of the inguinal nodes. The connective tissue about the ulcerated areas is frequently hypertrophied and œdematous. The ulceration usually begins about the

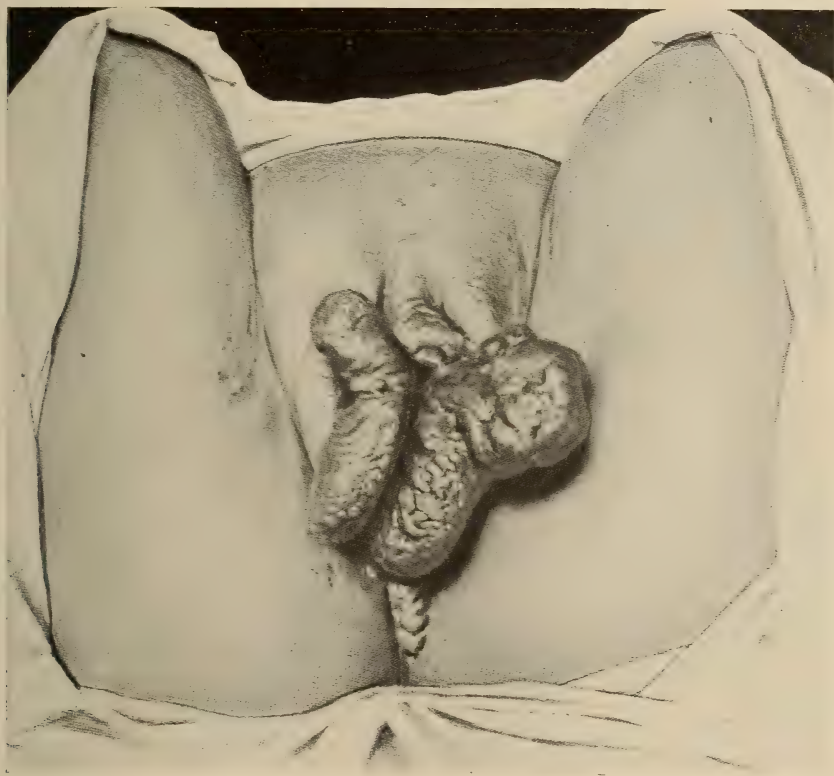


FIG. 181.—Lupus of vulva, a pre-ulcerative or infiltrative stage. (After Bender.)

fossa navicularis, and extends by a serpiginous course to the lateral walls of the vagina, urethra, labia, and rectum, producing, often in the later stages, fistulous tracts.

The parts should be kept scrupulously clean. The general health should be improved. Ulcers and fistulous tracts should be cauterized with nitric acid or the actual cautery at a dull red heat. Antisymphilitic or mixed treatment should be prescribed, and in some cases of supposed rodent ulcer has been of marked benefit. In three cases observed by Fisichella salvarsan effected a rapid cure. In rebellious cases radium may be tried.

Fibromyoma of the vulva affects by preference the labia majora, and presents the same structural features as fibromyoma elsewhere in the body.

The symptoms are the result of mechanical interference. The condition is extremely rare (Fig. 183). The tumor should be removed by operation, and the wound closed by plastic repair.

Lipoma of the vulva is most often situated in the labia majora or on the mons veneris, and resembles lipomatous tumors found in other parts (Fig. 184). Excision of the growth with plastic repair is indicated.

Sebaceous cysts may form in the larger and smaller labia. They appear as small, yellowish elevations. The treatment consists of excision.

The Vulvovaginal Glands—Inflammation of the Ducts and Abscess.—Inflammation of the ducts of the vulvovaginal glands is usually of gonorrhœal origin, but it may be due to other infections, notably of the colon bacillus

and the tubercle bacillus, extending from the surface. Tuberculous vulvovaginal abscess is not infrequently observed in phthisis. In gonorrhœal inflammation of the duct the orifice is surrounded by a red, slightly elevated spot, known as the gonorrhœal macule. Pressure over the course of the duct will express a drop of pus. Inflammation of the ducts of the vulvovaginal glands may lead to the formation of a retention cyst or to an extension of the infection to the gland substance, with the production of an abscess. Abscess of the vulvovaginal gland is manifested by severe pain and marked swelling and œdema of the surrounding parts.



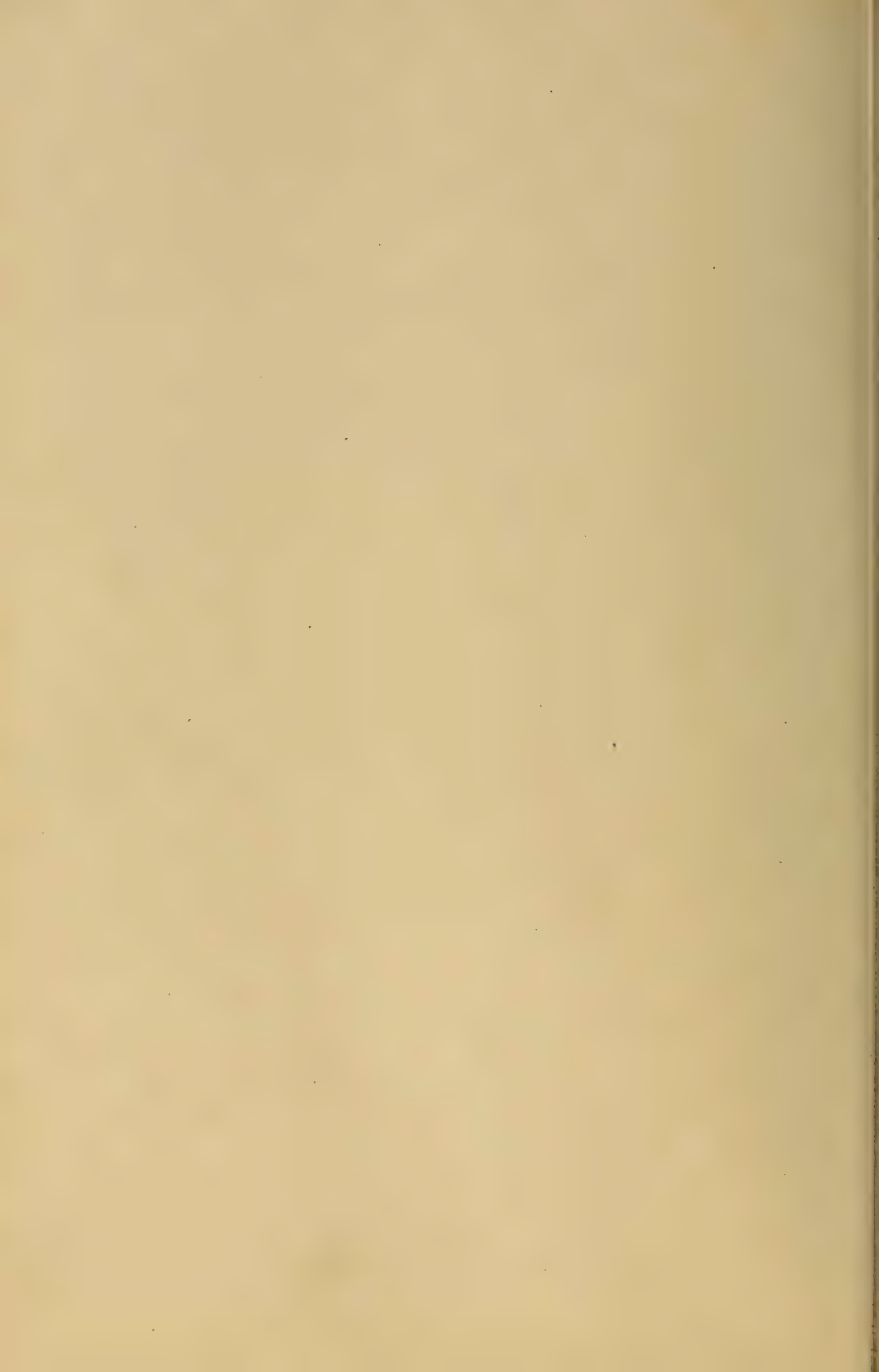
FIG. 182.—Sarcoma of left labium minus (Hirst's Obstetrics. W. B. Saunders Co.)

The swelling may extend even to the anus. Fluctuation appears first upon the inner surface of the labium, and, if the pus is not evacuated by incision, it finally makes its way through several fistulous openings below the orifice of the duct. These openings may keep on discharging indefinitely.

The treatment of an infection of the ducts of the vulvovaginal glands consists in keeping the duct patulous and in injecting an antiseptic solution by means of a blunt hypodermic needle. Before introducing the needle, all the pus should be expressed from the gland and the orifice wiped clean. The needle should then be passed gently as far as it will go, and the solution injected, the needle being held in position for a few seconds and the duct compressed about the barrel. As a rule, only one or two drops can be



FIG. 183.—Fibromyoma of vulva. (After Collyer.) *American Journal of Obstetrics.*



injected. This treatment should be repeated daily. Pure ichthyol (25 per cent.), solution of argyrol, or 5 per cent. silver nitrate may be used. If the treatment is not successful, the duct of the gland should be laid open freely and cauterized, or the duct and the entire gland should be dissected out.

In the early stage an abscess of the vulvovaginal gland (Fig. 185) may be treated by means of hot fomentations. As soon as fluctuation appears, a free incision should be made and the entire cavity swabbed out with pure phenol and the cavity packed with gauze and allowed to heal by granulation. When there is a tendency for these abscesses to recur, the glands should be totally excised.

Cyst of the vulvovaginal glands either occurs as the result of an occlusion of the duct by an inflammatory process, or is due to a thickening of the glandular secretion. The symptoms of vulvovaginal cysts are usually the result of mechanical interference with sitting, walking, or sexual intercourse. Vulvovaginal cysts vary in size from a walnut to a child's head. When they reach the dimensions of an egg or even larger, the mucosa to the inner side of the labium, overlying the surface of the cyst, is considerably thinned. The cyst contents are clear and colorless, or may be yellow or a turbid chocolate color from admixture with blood. Vulvovaginal cysts must be distinguished from inguinal hernia, hydrocele of the canal of Nuck, and cysts of old hernia sacs. In these conditions the enlargement is situated more to the upper and outer part of the labium majus, and is connected with the external inguinal ring.

Vulvovaginal cysts should be excised. This is best done while the tumor is small, since in advanced cases the vulvar mucosa becomes so thin and attenuated, and the cyst so deeply attached that considerable dissection is necessary to effect its removal, and the wound may have to be packed and allowed to granulate. This is due to the fact that the flaps of thinned-out mucosa are poorly supplied with blood and show a tendency to slough. If, for any reason, excision of the gland is not feasible, a free in-

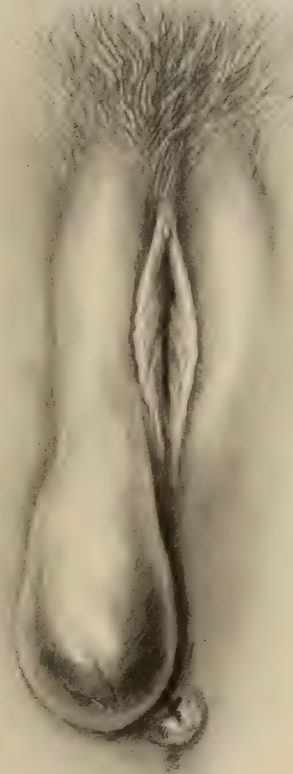


FIG. 184.—Lipoma of right labium majus.

cision may be made, and as much of the gland wall as possible cut away with scissors, the interior swabbed with pure phenol, packed with gauze, and allowed to heal by granulation.

Injuries of the External Genitalia.—The vulva is often the seat of injury and violence. It may be injured as the result of a fall astride a fence, the edge of a bath-tub, the arm of a chair, or the frame of a bicycle; it may be lacerated by a fall upon some protruding object, such as the paling of a fence or the handle of a rake, or by sitting upon a knife, a pair of scissors,



FIG. 185.—Abscess of left vulvovaginal gland. Kelly's Operative Gynecology (D. Appleton & Co.).

or a crochet-hook. The vulva may be seriously bruised and lacerated by the horns of a cow or as the result of a kick, or by violence inflicted during coitus. Insane persons sometimes mutilate the vulvar region. The wounds may be incised, lacerated, contused, or punctured. Such injuries are accompanied by the usual symptoms of pain and hemorrhage. The latter is frequently profuse, owing to the vascularity of the parts affected. It may be partly or entirely concealed, forming a hæmatoma that appears as a dark, bluish-red mass, occupying the greater labium or the vaginal wall.

Injury during the first coitus sometimes produces alarming hemorrhage.

The rape of young girls or infants by adults may result in injury or laceration of the vagina and perineum, or even in a tear of the rectovaginal septum or the sphincter. Bilateral splitting of the urethra as far up as the bladder, with the production of a vesico-urethrovaginal fistula, also a rupture of the posterior vaginal fornix, has been observed. The injury must be dealt with according to its nature and according to the character of the injuring force. Clean incised or punctured wounds may be disinfected and immediately closed with catgut or silkworm-gut sutures. Contused and lacerated wounds in which submucous and subcutaneous hemorrhages are present are best treated at first by local applications of ice and antiseptic compresses. After hemorrhage has ceased and the danger of infection no longer threatens, hot applications may be substituted in order to favor the absorption of extravasated blood. If this does not occur promptly and rapidly, the accumulated mass may be opened by free incision, the clot turned out, and the cavity closed with drainage.

Pudendal Hernia.—Distention of either labium majus from a complete inguinal hernia may occur, the condition being analogous to a scrotal hernia in the male. A tumor of the affected part is formed that has the usual characteristics of a hernia, which need not be detailed here. Marked examples of pudendal hernia are not nearly so frequent in the female as extensive scrotal hernia is in the male. Inguinal hernias in women are more apt to be small, distending only the upper part of the corresponding labium majus and the corresponding area of the mons veneris. A rare form of hernia, known as *perineal*, manifests itself in the form of a protrusion of gut or omentum through a weakened area in the perineal floor, which is located either between neighboring fasciculi of the levator ani and the coccygeus muscle, or at the site of the rectal or vaginal sheath, which penetrates and is surrounded by the muscles and fascia of the perineal floor. In the most frequent form the protrusion descends along the vagina, forming a tumor to one or the other side of the vaginal orifice (Fig. 186). It may present all the usual characteristics of a hernia, being tympanitic on percussion, showing a marked impulse on coughing, and disappearing when the patient assumes

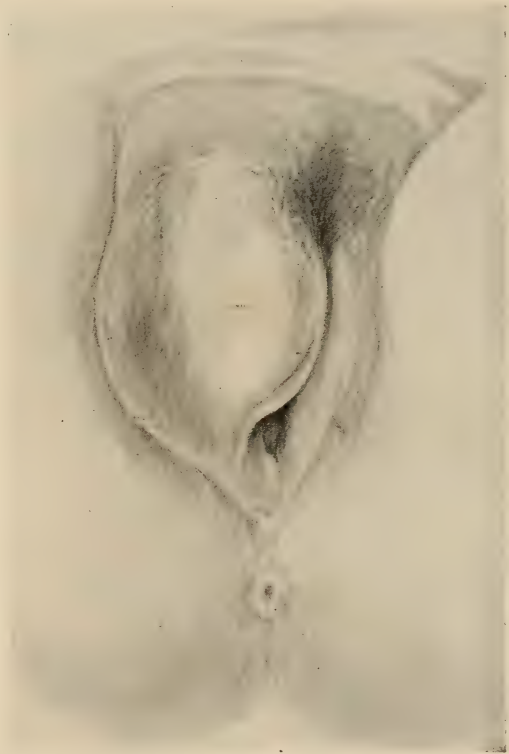


FIG. 186.—Extreme cystic distention of vulvovaginal gland, simulating a labial hernia.

the recumbent posture or when suitable manipulations are instituted. Perineal hernias must be distinguished from cystocele and rectocele, vaginal cysts, the ordinary enterocele associated with the bladder or rectum, diverticula in prolapse, etc. In a majority of instances the treatment is surgical. The operation consists in dividing the skin and fascia over the tumor, exposing the sac, separating it from surrounding structures, opening the sac, and releasing the intestine or omentum, excising the sac, and bringing the margins of the wound together by means of chromic or silkworm-gut sutures. When the hiatus in the pelvic floor is very extensive, any attempt to close the hernial ring may appear impracticable. In such cases, and in those in which, because of age or illness, operation is inadvisable, some form of pad and perineal strap may be found useful.

BIBLIOGRAPHY

- ALBUTT, PLAYFAIR, AND EDEN: *System of Gynecology*. MacMillan Co., N. Y., 1906.
- BIDWELL AND CARPENTER: "Gonococcal Infections in Childhood." *Brit. Jour. Children's Diseases*, No. 10, 1904.
- BREISKY: "Über Kraurosis Vulvæ." *Zeitschrift f. Heilkunde*, 1885, vi, 69-80.
- BULKLEY, K.: "Tuberculosis of the Vulva." *Amer. Jour. Med. Sci.*, 1915, vol. cxlix, p. 535.
- CARY, W. H.: "The Conservative Treatment of Gonorrhœa in Women." *Am. Jour. Surg.*, 1911, vol. xxv, p. 373.
- COLLYER, H. L.: "Fibroma of Labium." *Amer. Jour. Obst.*, 1889, vol. xxii, p. 1252.
- CURTIS, A. H.: "On the Pathology and Treatment of Chronic Leucorrhœa." *Surg., Gyn. and Obst.*, 1914, vol. xix, p. 25.
- DEMME: "Beitrag zur Tuberculose des Kindesalters." *Wien, Med. Blät.*, 1887, Bd. I.
- DUDLEY, E. C.: *The Principles and Practice of Gynecology*. Lea and Febiger, Phila., 1913.
- EDGAR, J. C.: *Obstetrics*. P. Blakiston's Sons & Co.
- FISICHELLA, V.: "La cura dell' Ulcera cronica Vulvare." *Il Policlinico*, 1915, vol. xxii, p. 485.
- FROMME: "Gutartige Geschwulste in das grossere Labien." *Monats. f. Geb. u. Gyn.*, 1904, Bd. xx, S. 961.
- GÜNTHER: "Esthiom'ene." *Amer. Jour. Obst.*, 1904, vol. xlix, 373.
- HAMILTON, WALLACE: "Gonococcus Vulvovaginitis in Children." *J. Am. Med. Assn.*, 1910, vol. liv, p. 1196.
- HART: "Epithelioma Vulvæ." *London Practitioner*, Feb., 1895, vol. liv, p. 118.
- HENSCHUS, F.: "Vaccine Behandlung der weiblichen Gonorrhoe." *Monatschr. f. Geburtsh u. Gynäk.*, 1911, vol. xxxiii, p. 426.
- HURDON: "Pathology of the Reproductive Organs." *Kelly-Noble's Gynecology and Abdominal Surgery*, Saunders, Phila., 1907.
- KIMBALL: "Gonorrhœa in Infants, with a Report of Eight Cases of Pyæmia." *Med. Records*, N. Y., vol. lxiv, p. 761.
- MORROW, L., AND BRIDGMAN, O.: "Gonorrhœa in Girls; Treatment of 300 Cases." *J. A. M. A.*, May 25, 1912, vol. lviii, p. 1564.
- MUNK, H.: "Ein Beitrage zur Kenntniss und Behandlung des Pruritus Vulvæ." *Prag. med. Wochenschr.*, 1902, No. 45.
- NORRIS: "The Diagnosis and Treatment of Gonococcal Vulvovaginitis in Infants and Young Children." *J. A. M. A.*, 1915, vol. lxxv, p. 327.
- PICHEVIN: "Esthiom'ene de la Vulve." *La Sem. Gyn.*, 1905, T. x, p. 38.
- POWERS, D., AND MURPHY, J. K.: "A System of Syphilis." Oxford Medical Publications, 1908.
- RAVOGLI, A.: *A Text-book of Gynecology*. C. A. L. Reed, 1901.
- SÄNGER: "Aetiologie u. Behand. der Vulvitis Pruriginosa." *Cent. f. Gynäk.*, 1894, S. 154.
- SINCLAIR, J. F.: "Investigations in Vulvovaginitis by Means of Female Urethroscope." *Arch. Ped.*, 1914, vol. xxxi, p. 29.
- STEIN, A.: "Primary Carcinoma of the Vulva." *Amer. Jour. Obst.*, 1896, vol. lxxiv, p. 577.
- TAUSSIG, F. J.: "The Prevention and Treatment of Vulvovaginitis in Children." *Am. Jour. Med. Sci.*, 1914, vol. cxlviii, p. 480; *Ibid.*: "Etiologic Study of Vulvar Carcinoma." *Amer. Jour. Obst.*, 1917, vol. lxxvi, p. 794; *Ibid.*: "Etiologic Study of Vulvar Carcinoma." *Trans. Amer. Gyn. Soc.*, 1917, vol. xlii, p. 463.

- TAYLOR: "Venereal and Skin Diseases." Clinical Atlas, Lea and Febiger, Phila., 1889.
Ibid.: Genito-urinary and Venereal Diseases. Lea and Febiger, Phila., 1904.
- WAGNER: "Zur Behandlung der Cervical Gonorrhöe." Berlin, klin. Woch., Dec. 25, 1911, No. 52, p. 2339.
- WEBSTER: "Nerve Endings in Labia Minora and Clitoris; Pathology of Puritus Vulvæ." Edinburgh Med. Jour., July, 1891.
- WEINSTEIN, E.: "Die Vaccinetherapie nach Wright bei der Vulvo Vaginitis der Kinder." München. med. Wochnschr., 1910, vol. lvii, p. 762.
- WHITE AND MARTIN: Genito-Urinary Surgery and Venereal Diseases. By Martin, E., Thomas, B. A., Moorhead, S. W. J. B. Lippincott Company, Phila. and London, 1917.

CHAPTER XII

DISEASES OF THE HYMEN AND VAGINA

Abnormal rigidity or abnormal elasticity of the hymen may occasionally be found. The former may render intercourse impossible; the latter may be compatible with coitus and miscarriage without injury.

Cystic tumors of the hymen are at times observed. These are either congenital or have their beginning in the coalescence of the hymeneal folds following inflammation.

Vaginitis.—Vaginitis is usually subacute or chronic, except in the case of children and elderly women. In the young and in the old the mucosa of the vagina and vulva is delicate and tender, so that it is more susceptible to acute inflammatory lesions. When vaginitis occurs during the reproductive period, it is less likely to be acute, and depends upon repeated infection plus a mechanical irritation or injury, or upon some general condition that lowers the vitality of the vaginal mucosa. The predisposing factors of vaginitis are venous stasis, the hyperæmia incident to pregnancy, small abrasions of the mucosa, and the irritation of foreign bodies. In infants and in young children gonorrhœa is the most frequent cause. A long-continued discharge of gonorrhœal pus from the cervix is the most common cause in adults. Vesicovaginal fistula is almost always accompanied by vaginitis, and puerperal infections of different varieties may attack the vagina. Vaginitis may also complicate pneumonia, scarlet fever, diphtheria, typhus fever, dysentery, and measles, especially in children.

In *acute vaginitis* the vaginal walls are red, swollen, hot, tender, and covered with a mucopurulent or purulent discharge. As a rule, the entire length of the vaginal canal is not involved, except in children. The vulva is bathed in the discharge, which becomes highly offensive.

In *subacute* or in *chronic vaginitis* the vaginal surface is covered with numerous small red spots, caused by inflammatory infiltration of the papillæ in the mucosa. The overlying epithelium subsequently desquamates, and small eroded areas are formed. In old and in young persons such areas, when they are apposed, may become adherent. In this variety the vaginal walls are covered with a thinner and less purulent discharge than in the acute form. In old, chronic cases the lesions may be limited to eroded patches in the vaginal vault. In children the local examination should be confined to an inspection of the vaginal orifice or to the introduction of a small Kelly cystoscope into the vagina. In the adult, examination of the vagina is preferably made by means of a Sims' speculum, with the patient in the Sims' or in the knee-chest position.

The treatment of acute vaginitis consists of rest in bed, the administration of saline laxatives, and the use of warm vaginal douches of solutions of sodium chloride, sodium bicarbonate, or borax (1 dram to 1 pint. If the

pain is very severe, these douches must be given with great gentleness, using a soft-rubber catheter instead of a douche nozzle. The vaginal discharge must be caught upon vulvar pads, which should be burned.

If the attack is gonorrhœal in origin, the patient should be warned of the danger of carrying the infection to the eyes.

After the acute stage has passed, the vaginal walls should be cleansed with absorbent cotton and painted with a 5 to 10 per cent. solution of silver nitrate. Following this a tampon covered with zinc oxide ointment should be inserted and left in place twenty-four hours. This treatment should be repeated at weekly intervals. In addition a daily douche of salt or borax solution (3i—Oj) should be ordered, to be followed by an astringent and antiseptic douche, such as the following:

R. Ac. boric.	3 iv
Phenol.	
Pulv. alum. ex.	aa 3 iv
Ol. gaultheriæ	mx xxx
Ol. menth. pip.	mx xv

Sig.—1 dram to 2 pints of water; used as a douche.

Applications of silver nitrate (10 per cent.), followed by zinc oxide ointment, are especially effectual in cases of so-called *senile vaginitis*, occurring in women past the menopause. In this condition there is a thin, acid, offensive discharge, with irritation and redness of the vulvar mucosa, intense itching, and burning. Two or three applications of the silver nitrate and zinc oxide ointment to the entire vagina and vulva are usually sufficient to clear up the condition for a month or six weeks, when it may be necessary to repeat the treatment. Block and Llewellyn, also Brindeau, have had gratifying results from the use of the Bulgarian lactic acid bacillus (see page 198).

The yeast treatment, as devised by Landau, consists of the introduction, within the vagina, of a quantity of yeast fungi under conditions that favor their rapid growth and the destruction of all other bacterial forms. Landau used brewers' yeast and a solution of cane-sugar.

A more convenient method consists of applying to the vagina, after thorough preparatory cleansing, two or three tampons moistened with a 10 per cent. solution of glucose and filled with dry yeast powder. The tampons are left in place for twenty-four hours, when they are removed and a douche of sterile water administered. The treatment is repeated at intervals of forty-eight hours.

Curtis recommends particularly the use of antiseptic powders. Some that have given the best results are as follows:

R. Alumin. acetat.	1 part
Kaolin.	
Talc.	of each 2 parts
R. Pulv. alum ex.	
Ac. boric.	
Bismuth. subnitrat. aa.	
R. Ac. tannic.	
Lycopod. aa.	

Paravaginitis.—(See *Cellulitis*.)

Vaginismus is the name given to hyperæsthetic conditions of the vulva and vagina in which intercourse is rendered impossible because of painful contractions of the muscles of the vaginal outlet and perineum. The vaginal introitus may be too small or the hymen may be rigid, or the condition may be caused by some painful affection of the vulva (vulvitis, urethral caruncle), vagina (vaginitis), or pelvis (prolapsed ovary), or it may be neurotic in

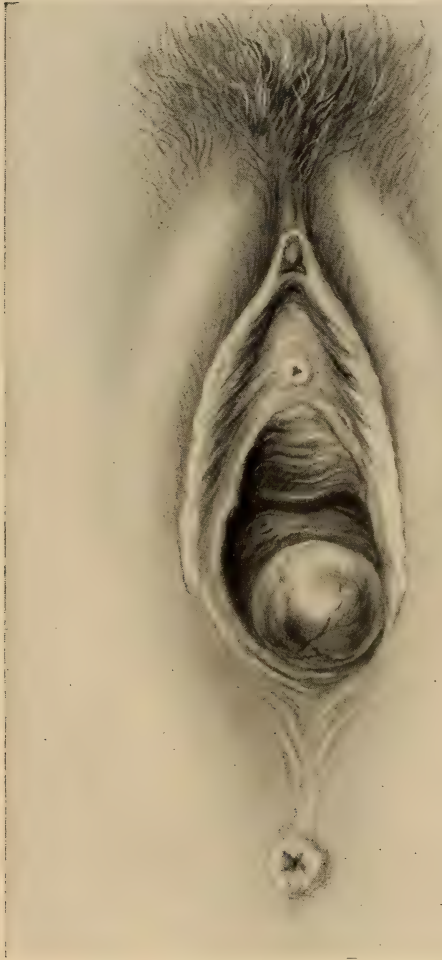


FIG. 187.—Cyst of the posterior vaginal wall.

origin. In the first class of cases the treatment is obvious—*viz.*, the removal of the cause. In the second class of cases gentle but persistent, gradual dilatation, supplemented by nerve sedatives and hygienic and tonic treatment, will effect a cure. In obstinate cases forcible dilatation under ether or actual incision with plastic repair, so designed as to increase the caliber of the vaginal introitus or the vaginal canal itself, may be successful. The use of soothing ointments or washes, and the plan of gradually accustoming the patient to the presence of a foreign body are of value. The general health should be improved by suitable tonic or roborant treatment.

Vaginal Cysts.—Vaginal cysts, while the most frequent of the vaginal tumors, are nevertheless rare. They result from the distention of aberrant vaginal glands, inclusions of epithelium following operations, hæmatomata,

dilatation of lymph-vessels, and the echinococcus. Rarely dermoid cysts are found. Cysts may also have their origin in rests of the Wolffian duct in the upper part of the vaginal vault. Such cysts are often multiple, and occur in rows. Vaginal cysts are hemispherical or ovoid in shape, and project more or less into the vagina (Fig. 187). Occasionally they may be pedunculated. The overlying mucosa is thinned out. The contents of a cyst may be clear, thin, and watery, glairy and opalescent, or chocolate colored.

When the tumor is small, symptoms may be absent. When the growth is large, there is interference with urination and defecation. The tumor may form an obstruction to intercourse or to labor. If the passage of the menstrual fluid is obstructed and an accumulation occurs above the tumor, a fetid leucorrhœa may be present. The condition must be distinguished from cystocele, rectocele, and suburethral abscess.

The only treatment to be considered is excision. This is readily accomplished by making an incision over the prominence of the tumor, in the



FIG. 188.—Sarcoma of vagina in a child 2½ years old, showing the grapelike polypoid masses in the vaginal canal. (Kelly and Noble's Gynecology and Abdominal Surgery. W. B. Saunders Co.)

axis of the vagina, and shelling out the cyst wall from the surrounding tissues. The wound is then closed by buried and superficial sutures. The approach to a cyst in the upper part of the vagina may present some difficulty, and the difficulty of excision is always increased if the cyst ruptures before it is enucleated. When enucleation is impracticable, as much of the cyst wall as possible should be excised with scissors, and the remainder cauterized and packed.

Fibromyoma of the vagina is an infrequent form of tumor. It presents the same peculiarities as fibromyoma elsewhere in the body. The treatment consists of enucleation followed by plastic repair.

Sarcoma of the vagina is very rare. In adults it appears as a diffuse growth that may be situated in any part of the vaginal canal. In young children it is polypoid or grape-like in form (Fig. 188), and springs from the anterior vaginal wall. The only hope for cure of sarcoma of the vagina lies in early radical operation. Grape-like sarcoma of the vagina in children is



FIG. 189.—A case of adenocarcinoma of posterior vaginal wall. (Kelly's Operative Gynecology. D. Appleton & Co.)

practically hopeless, all but one of the reported cases having proved fatal, in spite of the fact that extensive radical operations had been performed.

Carcinoma of the Vagina.—Primary cancer of the vagina is very rare; it is usually secondary to a growth situated higher in the genital tract (Fig. 189). The treatment of carcinoma of the vagina is unsatisfactory, since the primary tumor is almost invariably beyond the pale of radical cure. In the majority of cases about all that can be done is to perform thorough curette-

ment and cauterization, and to apply the other measures advised for inoperable carcinoma. The remarkable results that have been achieved in recent years by the use of radium make this form of treatment a distinct and hopeful addition to the therapy of carcinoma of the vagina.

Chorio-epithelioma of the vagina is a rare condition. It is caused by the deportation of chorionic villi from their original site in the uterus or tube to the vaginal blood-spaces and their subsequent growth and development in the new location. The appearance of the growth is suggestive of a vaginal varix. The treatment consists of prompt excision, together with removal of the primary seat of the growth. As in carcinoma of the vagina, radium constitutes the most hopeful form of treatment of chorio-epithelioma.

Foreign Bodies in the Vagina.—Foreign bodies of all sorts have been found in the vagina. They may have been introduced by patients mentally deranged or have been left by accident or neglect of the patient, physician, or nurse. Among those most commonly found are broken glass douche nozzles, pessaries, tampons, etc. Pessaries are not infrequently forgotten and while they give no inconvenience for a time, they gradually produce inflammation and ulceration. In elderly women the bloody, foul discharge may lead to a mistaken diagnosis of carcinoma. The symptoms usually subside on removal of the pessary, but considerable contraction and stenosis of the vagina may follow as a consequence. Not infrequently the pessary becomes practically embedded in the tissues and can be removed only piecemeal. In neglected cases of long standing, vesicovaginal or rectovaginal fistulæ may result.

Leucorrhœa.—Leucorrhœa (white discharge), in the common acceptance of the term, is the name given to a discharge from the genitalia that occurs independently of the menses. A leucorrhœal discharge is usually of a milky white color, but it may be yellow or tinged with blood; it may be comparatively odorless or very offensive. (See also Chapter VI, p. 99.)

The treatment of a given case of leucorrhœa depends, of course, upon the underlying cause, which may be any lesion or group of lesions of the genital tract.

Any case in which leucorrhœa is a prominent feature may require careful study, for there is hardly any symptom that causes greater discomfort and distress. The most troublesome cases are those in which the recognizable lesions are not marked. In fact, there may be no manifestations beyond the constant presence, on examination, of more or less discharge in the vaginal vault and about the external genitalia.

If all possible sources of the disorder have been sought for and no cause can be found, or if the presumptive underlying condition has been corrected and no improvement results, the indications point to an abnormal vaginal flora as the causative factor.

Curtis, who has studied these persistent cases, found that in a majority anaërobic bacteria were present in the cervix, vagina, and vulva. The ordinary pathogenic organisms were rarely found. The gonococcus was not often present, but this investigator concluded that a gonococcus

infection was frequently the precursor of the persistent and less virulent infection. The uterine cavity remains uninvolved.

An examination of smears of the discharge shows, besides many bacteria, pus cells and epithelium in varying proportion. Not infrequently a discharge that resembles pure pus is made up almost entirely of mucus and desquamated epithelium.

In these cases the aim is to destroy the lower grade anaërobic organisms and then restore the normal bacterial flora. This is done, first, by employing disinfecting applications, tampons, or douches, and then by placing a culture of the bacillus *Bulgaricus* (lactic acid bacillus) in the vaginal vault. As a means of disinfection a thorough application to the cervical canal and entire vagina of silver nitrate, 10 per cent., is perhaps the most effectual of the older remedies, but the tincture of iodine may be equally efficient. Recently a solution of chlorazene, followed by dichloramine-T tampons (2 per cent. in eucalyptus oil) has given excellent results. Findley recommends packing the vagina daily for a week with Fuller's earth, placing as much as possible into the vagina at every sitting without removing that previously introduced.

After the anaërobic bacteria have been destroyed or their number decimated by this plan, then cultures of the Bulgarian lactic-acid bacillus¹ mixed with sugar may be introduced. For this purpose tablets of the lactic-acid bacillus are most convenient; they should be moistened and mixed into a thick paste with sugar and a little water; this is spread upon the vaginal walls in the fornices. The treatment should be repeated every other day for

¹"*Technic.*—The patient is placed in the usual dorsal gynecologic position, and a thorough pelvic examination made, including smears, when indicated. A bivalve speculum is then inserted into the vagina, and the cervix and the upper vaginal canal exposed. The reaction of the vagina is then taken by moistening a piece of litmus paper in the vaginal secretion, after which the vagina is thoroughly cleansed of mucus and leucorrhœal discharges by means of a simple alkaline spray, and the vagina is then dried with cotton pledgets. A lactic acid tablet, preferably one that is readily soluble and made with a lactose base, is placed in a medicine glass and moistened with *one or two drops* of sterile water dropped on the tablet by means of a small pipette or eye-dropper. It is important not to supply more than a few drops of water to the tablet, otherwise the tablet will completely disintegrate and cannot be readily handled.

"If the proper kind of tablet is used, and only enough water is applied to moisten it will attain the consistency of thick cottage cheese, and may be readily lifted in toto by a pair of forceps. It is then placed in the upper vaginal canal, and spread over the walls and on the cervix by means of the forceps. If the tablet is of the proper consistency, it will adhere to the vaginal mucosa wherever placed, and will show no tendency to run out of the vagina, as is the case with ordinary solutions. The speculum is next withdrawn half way, with its blades open, to allow the upper vaginal canal to close over the tablet that has been applied. Finally the blades are closed and the instrument is withdrawn. No tampons are applied. The patient is instructed to return in a week, and all douching is absolutely interdicted. On her return the same technic is repeated, and she returns once a week for a reimplantation of the bacilli, until the vagina is acid—a result which, in a favorable case, is attained in about three or four weeks. After the reaction has become acid, no treatment is given so long as it remains so, although the patient returns at gradually increasing intervals to have the reaction taken. In favorable cases it is usually found necessary to reimplant organisms at intervals of from three to four weeks, since after that time the organisms seem to die, or at any rate to lose their potency. We might, therefore, state here that the treatment is seldom a permanent cure, but rather a good palliative measure, requiring attention about once a month and superseding douches."—(Block and Llewellyn: J. A. M. A., vol. lxix, No. 24, p. 2025, Dec. 15, 1917.)

a week, and in the interim no vaginal douches or tub-baths should be taken. Even in successful cases the implantation may need to be repeated occasionally.

Working on the theory that bacteria cannot thrive in the absence of moisture, Nassauer recommends insufflation of the vagina with fine white clay powder (*bolus alba*). For this purpose he has devised an apparatus that distends the vagina while the insufflation is being made. (The same effect may be secured by packing the vagina with the powder while the patient is in the knee-chest position.) The treatment should be carried out at first three or four times a day, but later less frequently. Nassauer asserts that a cure was effected in the majority of instances in 300 cases in which this treatment was used.

As a result of careful and scientific study of a large series of cases Curtis found that the most successful plan of treatment consisted in the use of autogenous vaccines, combined with dry cleansing of the vagina and applications of powder. This should be preceded by the destruction, by means of the cautery or otherwise, of cervical glands that are producing an excessive mucous discharge. Care of the general health, the use of active emunctories, and the treatment of associated pelvic lesions are all adjuncts not to be disregarded.

BIBLIOGRAPHY

- ABRAMS, O.: "Neuere Versuche Über die Hefebenhandlung des weiblichen Fluors." Monats. f. Geburtsh. u. Gynäk., 1910, vol. xxxi, p. 89.
- BLOCK, F. B., AND LEWELLYN, THOS. H.: "The Treatment of Leucorrhœa with Lactic Acid Bacilli." Jour. Amer. Med. Assoc., vol. lxix, No. 24, Dec. 15, 1917.
- BRINDEAU, L.: "Les Cultures de Bacillus Lactiques dans Le Traitement de l'Infection Puerpérale." Arch. mens. d'obst. e. d. gynec., 1912, i, 225.
- CULLEN, T. S.: "Vaginal Cysts." Trans. Amer. Gyn. Soc., 1904, vol. xxix, p. 459.
- CURTIS, A. H.: "The the Pathology and Treatment of Chronic Leucorrhœa." Surg., Gyn. and Obst., 1914, vol. xix, p. 25; *Ibid.*: "On the Etiology and Bacteriology of Leucorrhœa." Surg., Gyn. and Obst., 1914, vol. xviii, p. 299.
- HOLT: "Gonococcus Infections in Children, with Especial Reference to the Prevalence in Institutions and Means of Prevention." N. Y. Medical Jour. and Phila. Med. Jour., March, 1905, vol. lxxxi, Nos. 11 and 12.
- HUNNER, G. L.: "The Treatment of Leucorrhœa with the Actual Cautery." J. A. M. A., 1906, No. 3, vol. xlvi.
- McFARLAND, J.: "Sarcoma of the Vagina." Am. Jour. Med. Sci., 1911, vol. cxli, p. 570. (Complete Literature.)
- NASSAUER, M.: "Sur le Traitement des Écoulements chez da Femme." Annales de Gyn. et d'Obst., 1911, vol. viii, 2 serie, p. 477.
- TAUSSIG, F. J.: "The Prevention and Treatment of Vulvovaginitis in Children," Amer. Jour. Med. Sci., 1914, vol. cxlviii, p. 480.

CHAPTER XIII

INJURIES TO THE PERINEUM AND THEIR RESULTS

Mechanics of Normal Support.—The anatomy of the perineum, the origin and insertion of the various muscles that make up the pelvic diaphragm, and the arrangement of the pelvic fascia have been described. It only remains to state that the supporting power of the perineal floor does not depend exclusively upon the muscle or the fascia. For the greater part of the time one reinforces the other; thus when the perineal diaphragm is in absolute repose, the fascia maintains its form; during urination, defecation, labor, and on physical exertion the muscular tissues are chiefly called upon to functionate.

The levator ani and the pelvic fascia support the rectum, and in doing so the posterior vaginal wall, which is closely connected with the anterior wall of the rectum, is also supported. The vaginal walls being in contact, the support of the anterior wall is partly dependent upon the posterior wall, and the base of the bladder is in turn supported by it. Needless to say, the constrictor vaginæ, the transversus perinæi, the triangular ligaments, and the endopelvic reflection of the pelvic fascia play an important part in the support of these structures, and when the muscles of the pelvic floor are in repose, the vagina, bladder, and rectum are maintained in their normal position largely by means of their fascial attachments.

While the contraction of the levator ani muscle elevates the rectum, the external sphincter, in addition to constricting the anus, has a tendency, by virtue of its attachment to the tip of the coccyx, to draw the anus backward. When both the levator ani and the external sphincter act in unison, a certain amount of antagonistic action takes place at the site of the anus, which has been compared by Kelly to a "cut-off" valve.

The vagina and the urethra pass through both the anterior and the posterior layers of the triangular ligament. The base of the bladder is supported by the anterior vaginal wall, a few small muscular slips, the triangular ligament, and the pubo-vesico-cervical reflections of the pelvic fascia. The bladder is also attached lightly to the posterior surface of the symphysis and to the cervix. The intrinsic fascial and muscular supports of the bladder are sufficient to maintain it in position so long as they are fortified by the supporting action of the levator ani (Fig. 192). Just as soon as this supporting action is removed, however, they become incapable of holding the bladder permanently in its proper position.

Forms of Injury, Immediate and Remote.—A study of the mechanics of labor shows that, during the second stage, as the head advances through the parturient canal, lacerations of the vagina and perineum may occur in one of two ways—the advancing head may strip the vaginal wall loose from its underlying attachments and push it bodily in front of it, or the muscular loops and fascia that surround the parturient canal and the vaginal outlet may be so greatly overstretched as to be completely severed, the tear either passing through the mucous membrane

to the surface or being entirely submucous and not communicating with the exterior. Either form of tear may take place in the vaginal sulci or in the median line. When it occurs in the median line, it may involve the perineal body alone, or it may pass directly through the perineal body and the external sphincter into the rectum. Simultaneously the anterior vaginal wall, at the introitus, may undergo various forms of trauma, but the deepest and most pronounced lacerations are usually found posteriorly. A **median laceration** through the perineal body, since it does not involve the levator muscles and fascia, affects the perineal diaphragm but slightly. It does destroy in part the supporting action of the transversus perinæi muscles, the constrictor vaginæ, and the triangular ligaments. Nevertheless, if the levator ani itself is intact, there is no great impairment of the pelvic diaphragm.



FIG. 190.—Large rectocele in a multipara.

A **sulcus tear** (Fig. 193) means a separation or an avulsion of the anterior fibers of the levator sling and a tear of the levator fascia, with a consequent loss of support to the rectum to which these fibers are attached. If one sulcus is lacerated, the other is, as a rule, affected also, although it may be to a lesser degree. Consequently the lower part of the rectum loses its support, and this affects the corresponding part of the vagina and the bladder.

When such a laceration has occurred, the action of the external sphincter in drawing the anus backward becomes a factor of considerable importance in the subsequent course of anatomic changes. Being deprived of its natural support, the lower end of the rectum is drawn backward with each contraction of the sphincter, and the column of feces, instead of being driven toward

the anus during defecation, is driven toward the vagina, the posterior wall of which tends to pouch, forming a **rectocele** (Figs. 190 and 193).

When the anterior vaginal wall and the base of the bladder are deprived of the support that is normally afforded by an intact levator muscle and fascia, there is a tendency for the parts to sag, and their support now depends entirely upon their intrinsic fascial attachments and a few small muscles. When, in addition to levator incompetence, injuries have been inflicted on the fascia of the anterior vaginal wall and the vesical base, associated, perhaps, with a separation of the anterior vaginal wall from its



FIG. 191.—Sulcus tears and thinning of perineal body in a multipara.

underlying tissue, a sagging of the base of the bladder during attempts at lifting or urination occurs, with the subsequent formation of a **cystocele**.

The chief effect of a median tear that passes not only through the perineal body but also through the external sphincter muscle into the rectum, **complete tear**, consists in an inability to control the passage of flatus or of fæces from the bowel. The tear rarely may be entirely submucous, the rupture in the fibers of the external sphincter being unaccompanied by any lesion in the overlying skin or mucous membrane. After a difficult labor incontinence of gas or of fæces may be due to a temporary paralysis of the sphincter muscle,

the result of the pressure and the stretching to which it has been subjected. This temporary incontinence may simulate a submucous rupture of the sphincter.

A complete tear, if uncomplicated, especially if it occurs directly in the median line, affects the support of the perineum but little (Fig. 194). The levator fibers are not greatly affected, and it is quite unusual, although, of course, it is possible, for a patient who suffers with a complete tear of the perineum to display many symptoms of general relaxation of the pelvic floor. In some cases this is probably due to the fact that the great distress caused by a complete tear usually leads to comparatively early operative treatment.

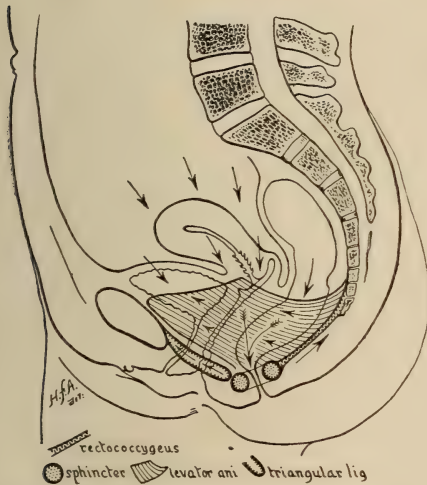


FIG. 192.—Schematic drawing to show the support given by the levator ani and triangular ligaments to the pelvic viscera; note the pull upward by these structures to counteract the downward intra-abdominal pressure. The rectum, anus and perineal body are well held up.

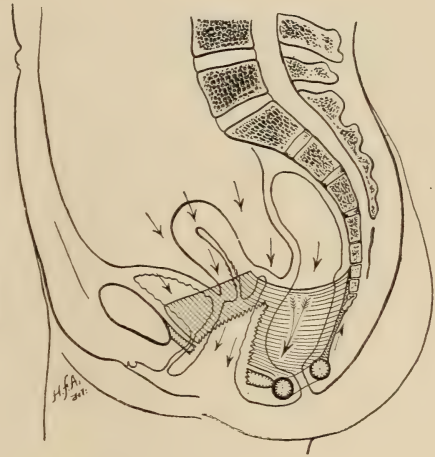


FIG. 193.—Schematic drawing to show the effect of sulcus lacerations of the levator ani and triangular ligament; the rectum, anus and perineal body drop back, having lost their support, the recto-coccygeus slip of the external sphincter pulls the anus and the lower end of the rectum backward, the fecal current is directed toward the gaping vaginal orifice and the posterior vaginal wall; nothing now opposes the downward intra-abdominal pressure but the uterine ligaments and the intrinsic attachments of the bladder.

Symptoms.—The symptoms of a relaxation of the perineum are attributable to a loss of the support that it normally affords to the generative tract, and to the secondary lesions which it may occasion, namely, cystocele, rectocele, and descensus uteri (Fig. 195). The symptoms do not manifest themselves until the patient has left her bed and has resumed her daily duties. There is a feeling as if the entrance to the vagina was open, and as if the supporting power of the pelvic floor was lost. This feeling of weakness becomes more marked when any unusual muscular effort is attempted. If the exertion is continued for any length of time, standing or walking, the patient complains of sacral backache, a dragging sensation in the lower abdomen, and a feeling as if the vaginal structures were about to protrude. The symptoms are all relieved on assuming the recumbent posture.

If a well-marked rectocele (Fig. 190) develops there will be difficulty in defecation, associated with a peculiar pain that is caused by impingement of the fecal column upon the posterior vaginal wall. At times the attempt at defecation is successful only after the patient has taken an enema to liquefy the fæces, or she may learn that by pressing upon the posterior vaginal walls with the fingers she can deflect the fecal column through the anus.

When a cystocele (Fig. 196) develops, the patient complains of an in-



FIG. 194.—Complete laceration of perineum. Note the sphincter pits and the nearly straight line of the divided muscle.

creased desire to urinate, especially when she has been upon her feet any length of time, and urination may be accompanied by a burning sensation or pain. In well-marked cystoceles the bladder becomes sacculated, and the patient is unable to empty the organ completely, so that there is always present a certain amount of residual urine which may undergo ammoniacal change and give rise to a low-grade cystitis. Occasionally the patient discovers that she is able to empty her bladder by pressing the cystocele upward with the fingers.

Diagnosis.—All the symptoms of relaxation of the pelvic floor are improved by the recumbent posture or by vaginal tampons and the application of a snug perineal bandage. In most cases, on examination the relaxation will be

revealed by simple inspection, but occasionally a few associated symptoms may be especially brought out by palpation. In the normal individual the vaginal introitus is closed; the perineal body is thick, and its surface is slightly concave; the anus is well puckered and drawn up close to a line connecting the tuberosity of the ischia; the natal and the gluteal clefts are deep. If the patient is directed to bear down, there will be a bulging of the

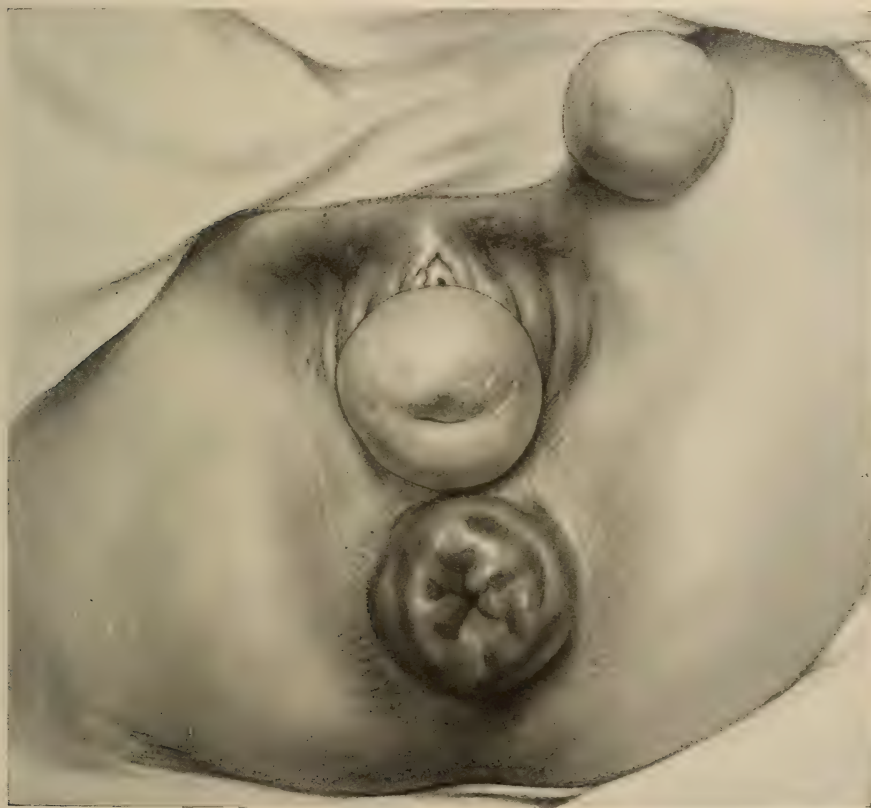


FIG. 195.—Prolapse of uterus with cervix projecting from vulva; prolapsed rectal mucosa; fibrolipoma of thigh.

perineum (Fig. 197), but no opening of the vagina and no prolapse of its walls.

The relaxed perineum presents quite a different appearance from that just described. The vaginal introitus is open; the anterior and the posterior vaginal walls are not in contact; the perineal body is attenuated and bulging; the anus is retracted, the pucker of the sphincter muscle is less marked, and the natal and the gluteal clefts are shallow. If the woman is directed to bear down, the anterior and posterior walls of the vagina tend to descend, and if cystocele or rectocele is present, the characteristic protrusion will be noticed (Fig. 198). The perineal reflex is weak or absent.

When the perineal diaphragm is intact, a finger inserted within the vagina perceives, at either side, the anterior border of the levator ani muscle and the substantial thickness of the perineal body. In the relaxed perineum the perineal body may be extremely thin, so that there is almost no fascia or muscle between the skin surface and the anterior rectal wall. If the levator muscle has been torn, a break in its anterior border may be felt, and the separation of its fibers may have left a distinct furrow or cleft in the vaginal sulcus into which the finger may be laid. In marked rectoceles the

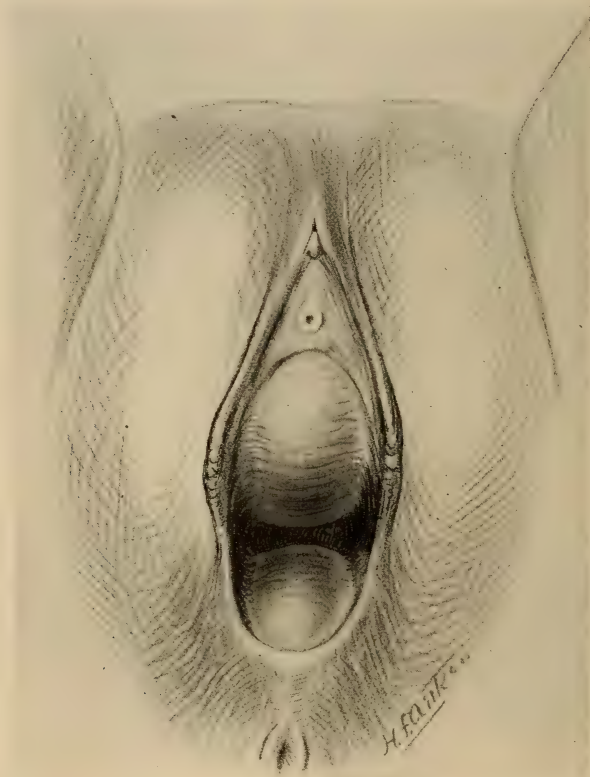


FIG. 196.—Cystocele: Rectocele; note the gaping vaginal orifice; the anterior and posterior walls are not in contact; the perineal body is thin and dropped down; the perineal raphe is obliterated.

posterior vaginal and the anterior rectal wall is readily everted through the anus, or slight pressure upon the posterior wall of the vagina with a finger in either sulcus may be sufficient to expose the cervix. If the woman is placed in the Sims' or the knee-chest posture, marked ballooning of the vaginal vault at once occurs. Retraction of the posterior vaginal wall with a speculum is unnecessary. The presence of a rectocele can readily be demonstrated by rectal examination: when the finger is directed forward into the anterior rectal pouch, it can carry the posterior vaginal wall before it, almost without any resistance, through the vaginal orifice. The relations

of a cystocele can be demonstrated with the aid of a catheter or a vesical sound.

The symptoms and diagnosis of a complete perineal tear are dependent chiefly upon the observation of the patient that she has involuntary passages of fæces or flatus from the rectum. This lack of control may not be absolute. Thus the woman may, under ordinary circumstances, be able to hold both fæces and gas, but when the intestinal contents is liquid, as following a laxative or an enema, inhibition may be deficient or faulty. In such cases the

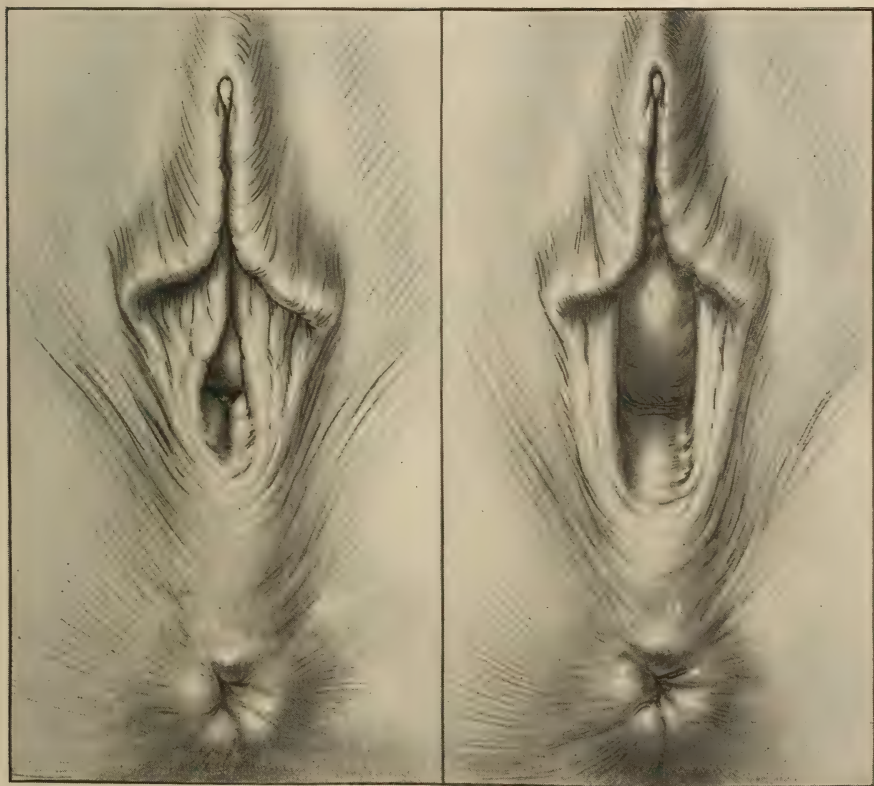


FIG. 197.—Normal nulliparous outlet, patient straining. FIG. 198.—Relaxed outlet, patient straining.

laceration may involve only the fibers of the external sphincter, leaving the internal sphincter intact, or fibrous union of the sphincter ends may have occurred and may be so nearly perfect that the muscle under usual conditions is competent.

The objective symptoms of a complete tear consist chiefly in an altered appearance of the anus. This muscle, instead of being circular and puckered throughout its entire extent, is bow-shaped or straight, and more or less deficient anteriorly where the tear in the posterior wall of the vagina and the recto-vaginal septum exposes the mucosa of the rectum, which presents a bright-red color. The pucker of torn muscle ceases at a varying dis-

tance to either side of the median line, depending upon the position and extent of the tear; on both sides, directly over the point where the puckering ends, there is a retraction or a dimpling of the skin surfaces.

The median tear and the exposure of the rectal mucosa are the result of a laceration directly through the posterior vaginal wall, perineal body, and anterior wall of the rectum. The dimples on either side are known as the sphincter pits, and mark the position of the retracted ends of the divided sphincter.



FIG. 199.—Relaxed outlet.

Many variations of this typical picture may occur. The median tear may be insignificant, barely involving the external sphincter and not reaching the rectovaginal septum, or the tear in the sphincter may be almost completely submucous; in the latter event no external injury is apparent, but the sphincter ends are retracted, and upon inserting the finger into the rectum the failure of the muscle to surround the anus completely can readily be determined.

Treatment.—Needless to say, it is the duty of the obstetrician to repair,

directly after labor, any small injuries of the perineum that are present. The question of operating at once when the labor has been prolonged or difficult; when considerable bruising of the tissues has occurred and the chances of infection are multiplied, and when detachment of the vaginal walls and submucous injuries appear probable, is still a matter of doubt. It appears, however, that if the patient is subjected to operation a week or two after, rather than at the time of, delivery, she will ultimately be in better condition.

Except in the case of very simple lacerations, swelling and œdema are so severe directly following labor that, in spite of the most painstaking care, an immediate perineorrhaphy is often disappointing in its result. At this time submucous injury may easily escape observation, and because of distortion the parts cannot be apposed perfectly. It is good practice in these cases, whenever possible, to obtain the patient's consent to postpone the operation for about a week or ten days, when more satisfactory surgical measures may be undertaken, in submucous injuries making a denudation and passing deep sutures. The more frequent use of perineotomy, lateral or median, in the second stage of labor, with immediate primary repair, will obviate a majority of extensive lacerations and preserve the integrity of the pelvic floor. This subject, however, belongs to the domain of obstetrics; here we deal chiefly with the secondary operations of perineorrhaphy, which belong to the field of gynecology.

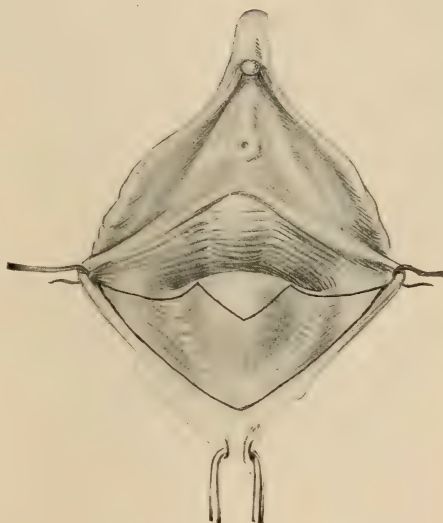


FIG. 200.—Emmet perineorrhaphy. Outline of the denudation, two vaginal and one perineal triangle.

PERINEORRHAPHY

Many operations have been devised for the restoration of the posterior segment of a relaxed pelvic floor, but two stand out preëminently: one is the operation of Emmet, and the other is the operation of Hegar. Although these remain as the two types of operation that are most efficient, excellent modifications of each have been devised.

In all operations of this sort, two objects are to be achieved: the first is to take up the lax and redundant posterior vaginal wall, and the second is to bring together the lacerated borders of the levator muscle and fascia, as well as the retracted edges of the transversus perinæi and the constrictor vaginæ muscles and the fasciæ that meet in the median line and are interposed between the vagina and the rectum or that surround the vaginal outlet.

In the Emmet operation the denudations involve each lateral sulcus of the vagina; this operation is, therefore, particularly well adapted to those

cases of relaxation that are due to sulcus tears. The sulcus denudation not only gives access to the torn and retracted fibers of the levator sling, but also takes up the redundancy of the posterior vaginal wall and attaches it to the fixed structures and fascia in the neighborhood of the pubic rami.

Hegar's operation is better adapted to those cases in which the tear is in the median line, and involves especially the perineal body; it is also the operation of choice in cases of relaxation of long standing, in which restoration of the pelvic floor must depend largely upon the fascial rather than upon the muscular supports. It is especially useful in the relaxation associated with the atrophy that takes place at the time of the menopause.

Both operations bring together structures that may have been divided or separated in the median line, and unite between the anus and the vaginal orifice, the transversus perinæi, triangular ligaments, and the most anterior fibers of the levator ani.

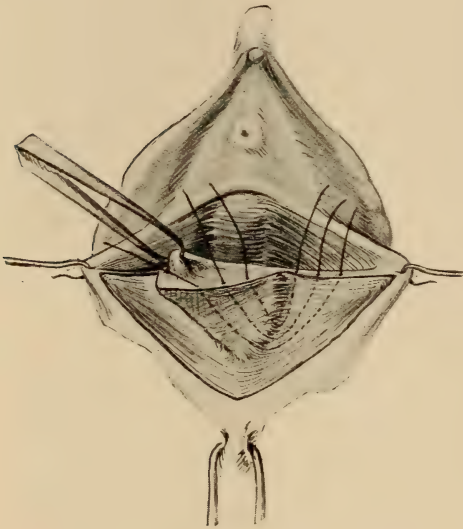


FIG. 201.—Emmet perineorrhaphy. The denudation completed. Sutures in one sulcus introduced but not tied. Note that the sutures are placed in such a manner that they will elevate the rectocele.



FIG. 202.—Emmet perineorrhaphy. The sulcus sutures tied on both sides. Crown sutures introduced. Note that they are inserted and brought out inside the denuded area.

The Emmet Operation.—Three points are selected and fixed with tenacula: First, the middle of the rectocele; second and third, a point just below Bartholin's duct, at either side of the vaginal orifice. By making traction on the central and on a lateral tenaculum, first on one side and then on the other, the borders of three triangular areas are brought into prominence and outlined by a scalpel, the incision being carried through the mucous membrane (Fig. 200). These incisions mark the areas where denudation is to be done, and should be carried up sufficiently high in either sulcus to embrace the entire extent of the relaxation or of the tear. The denudation is made in strips, by means of tissue forceps and curved scissors, care being taken to remove the mucosa and skin uniformly and to leave no undenuded areas. In the young, child-bearing woman as much

of the mucosa as possible should be preserved, the borders of the denudation being undermined, if need be, to expose the muscles and fascia.

The sulcus sutures are introduced, as shown in the illustration (Fig. 201). They are passed in such a way as to attach the loose posterior vaginal wall to the fixed lateral part, and to reunite and reattach to the muscular coat of the rectum the divided fibers or fascia of the levator ani muscle.

The sutures of the perineal triangle are known as the crown sutures (Fig. 202). They unite the structures that have been separated in the median line, restoring the perineal body and the muscles and fascia that meet normally at that point, and also draw some of the fibers of the levator ani muscles to the front, between the anus and the vagina, attaching them to the corresponding fibers of the opposite side.

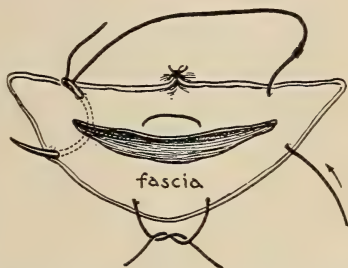


FIG. 203.—Showing transverse fascial split and introduction of crown sutures.

The most approved method of performing this operation varies somewhat from the classic description of Emmet. Care is taken to push the tip of the rectocele up into the vagina so as to avoid making traction upon the posterior vaginal wall, which would pull on the cervix and have a tendency to displace the uterus backward. As was previously pointed out, the sutures should be so passed that the posterior vaginal wall will be elevated instead of pulled down (Fig. 204). Before introducing the crown sutures, it is a good plan to divide the fascia of the denuded perineal triangle by a transverse incision from one side to the other (Fig. 203). This separates the structures to be united into two layers, each one of which is united in turn to its fellow of the opposite side by several extra-fine catgut sutures.

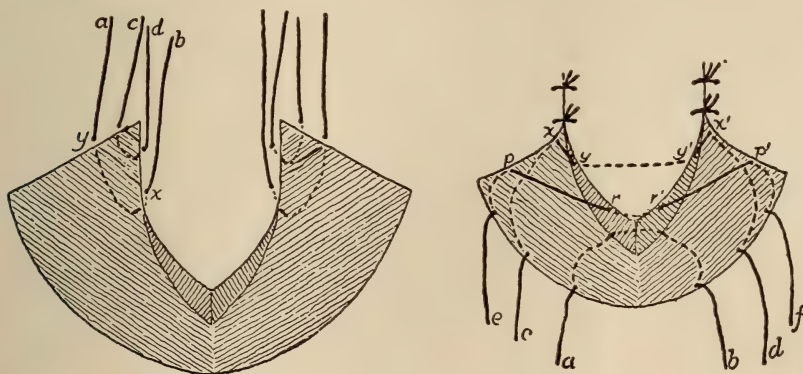


FIG. 204.—Diagrammatic sketches of Emmet perineorrhaphy.

The crown sutures are introduced in the ordinary way, surrounding both layers. By this plan a firmer union of the muscle and fascia which are brought together in the median line is obtained.

Hegar's Operation.—As in the Emmet operation, three points are fixed by tenacula, the tenaculum catching the rectocele being placed at a higher

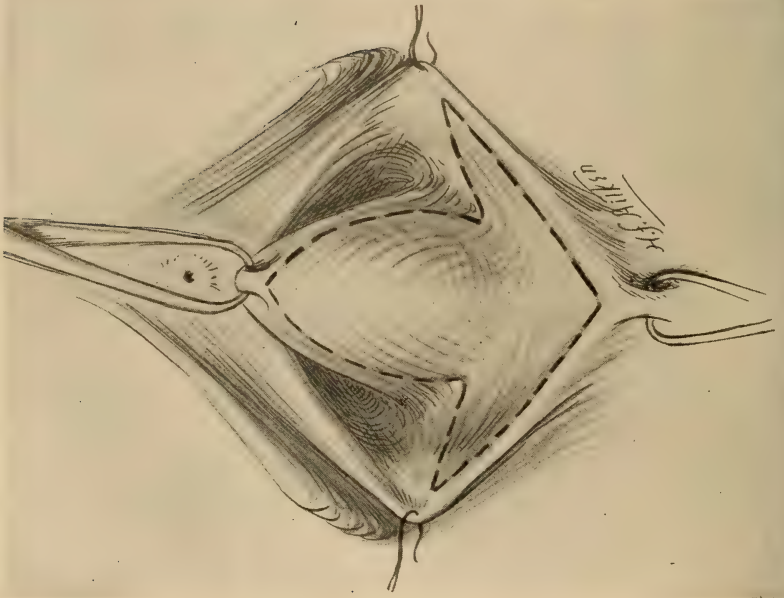


FIG. 205.—Hegar perineorrhaphy. Lines of denudation.

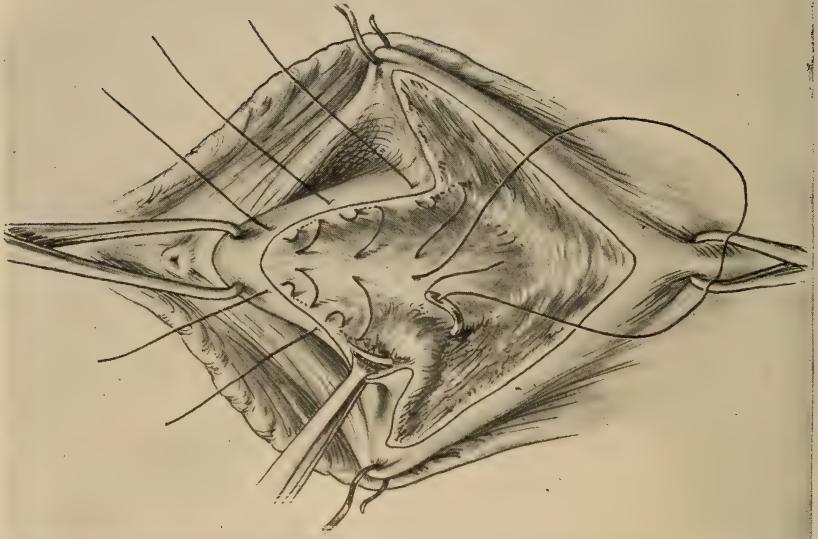


FIG. 206.—Hegar perineorrhaphy. Denudation completed and median sutures introduced.

point than in the Emmet operation; indeed, in cases of marked relaxation the tenaculum is inserted nearly at the top of the vagina. Ordinarily, however, the point of attachment is about an inch above where it would be for the Emmet operation.

The area to be denuded is determined as follows: When traction is made on the three tenacula, a fold of the posterior vaginal wall will be lifted up in the median line; this fold is triangular in shape, with its sides slanting toward the vaginal sulcus on either side. The borders of this fold are definitely established by drawing the rectal tenaculum upward and forward and the lateral ones to either side. The sides of this triangle are outlined by an incision through the mucosa running along each border to the corresponding vaginal sulcus. From the sulci the incision is carried upward and forward on either side to a point below the lateral tenaculum. A posterior incision is then made along the line of junction of the skin surface of the perineum with the posterior vaginal wall, between the two lateral tenacula (Fig. 205). The area outlined in this way is then denuded in the manner described for the Emmet operation.

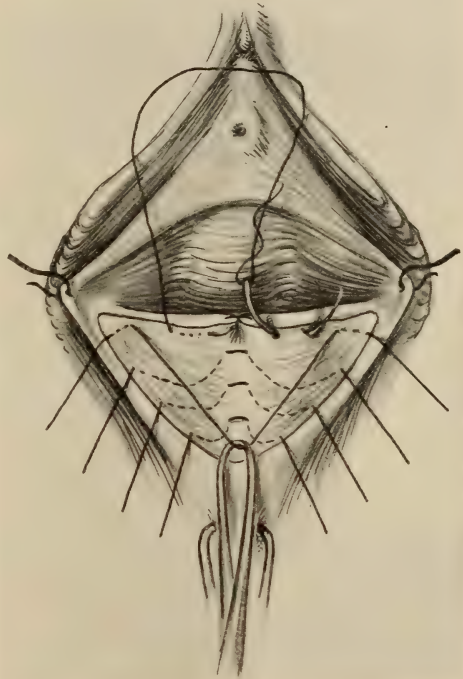


FIG. 207.—Hegar perineorrhaphy. Crown sutures introduced. The drawing does not show the full outward sweep of the needle. The beginning of the subcuticular suture.

The anterior wall of the rectum and the levator muscles and fascia are clearly exposed by blunt dissection. The adjacent borders of the posterior vaginal wall, the rectovaginal fascia, and the laterally lying fascia and fibers of the levator ani are now brought together by a series of interrupted sutures (Fig. 206). These sutures are continued in the median line to the base of the triangular denudation; as each succeeding suture is introduced, the preceding one, which until that time has served as a point of retraction, is cut, and the tissue which it grasps is allowed to slip up into the vagina. These median sutures take up the redundancy of the posterior vaginal wall, fix the tissues to the underlying rectovaginal fascia, and pull up and reattach in the median line, the rectovaginal fascia, the rectal wall, the retracted levator ani fibers and the levator fascia. (See also Figs. 208, 209 and 210.) The perineal sutures or the crown sutures are introduced in much the same manner (Fig. 207) as in the Emmet operation, with a transverse split as described on page 211, and practically have the same effect, so that the

chief difference between the two operations consists in the mode of dealing with the rectocele and with the torn and relaxed levator ani muscle and fascia.

Operation for Complete Tear.—The essential points in the operation for a complete tear of the perineum are: (1) To restore the rectovaginal septum;

and (2) to bring together the divided ends of the sphincter. Although, as has previously been stated, it is unusual to find a relaxation of the levator ani fibers in connection with a complete tear, the denudation required for such an operation includes also the denudation made for either the Hegar or the Emmet operation (Figs. 200 and 205). This is done not so much for the purpose of catching the retracted ends of the levator muscles as it is for the purpose of restoring fully the perineal body and the rectovaginal septum.

For this reason the last part of the denudation follows either the Emmet or the Hegar type of operation, although it is not at all extensive. The lower border of the line of denu-



FIG. 208.—Hegar perineorrhaphy. Levator ani suture in marked cases —upper sutures.

denation runs from the tenacula fastened below Bartholin's duct downward over the perineal body to the sphincter end on each side, which it encircles, and is then continued along the border between the rectal and vaginal mucosa to the median line, at the apex of the tear in the rectovaginal septum (Fig. 211).

When the tissue immediately over the sphincter pits has been denuded, the ends of the muscle are sought for with tissue forceps and separated slightly from the surrounding cicatricial tissue, so that they can be well drawn up and thoroughly exposed. The extreme ends of the sphincter may be snipped off in order to secure a better surface for approximation. The denudation along the margin of the tear in the rectal wall should be very carefully performed, so as to afford as clean and as broad a line for approximation as possible.

The first sutures restore the rectovaginal septum; they should consist of No. 1 chromic gut (ten-day), and be introduced from the perineal side, embracing the tissue down to but not penetrating the rectal mucosa (Fig. 212); or

they should be of fine linen, introduced from the rectal mucosa and tied within the bowel (Fig. 213). The first suture should be passed through the very apex of the rectovaginal tear; below this point they should be passed at intervals of one-eighth of an inch until the sphincter muscle is reached.

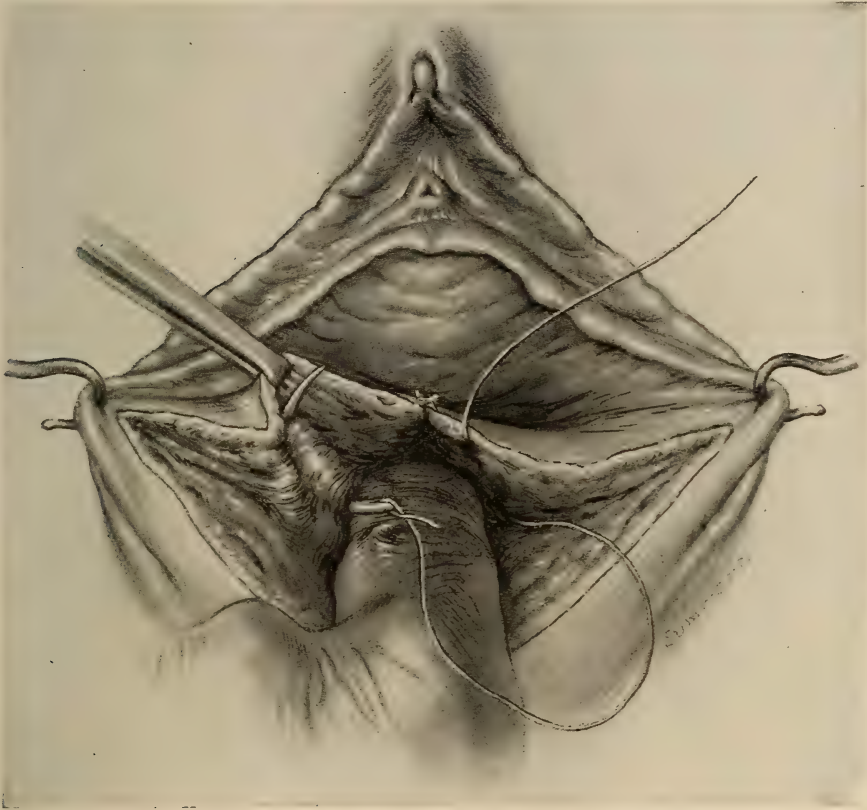


FIG. 209.—Hegar perineorrhaphy. Levator suture in marked cases. The upper sutures have been introduced. The introduction of the lower suture is indicated. The rectum is pushed back by the finger.

The sphincter end on each side is now pulled directly into the wound, and two No. 1 ten-day chromic catgut sutures are introduced from side to side, each suture catching both sphincter ends (Fig. 212). A No. 1 ten-day chromic catgut suture is now passed from a point external to the sphincter end on one side, through the tissues external to the margin of the rectovaginal tear, carried around above the apex of the tear, continued through the tissues of the opposite side, and brought out at a point opposite the site of its introduction (Fig. 214, No. 3). This stitch takes the strain off the sutures that approximate the sphincter ends. For the remainder of the operation the introduction of sutures is identical with that described for either the Emmet or the Hegar type of operation, omitting the transverse split of the tissues at the outlet. The operation is completed by the introduction of subcuticular sutures of No. 0 chromic gut, as shown in Figs. 210 and 214.

ANTERIOR COLPORRHAPHY; CYSTOPEXY

The surgical treatment of relaxation or ptosis of the anterior vaginal wall and the base of the bladder (cystocele) depends upon the extent of the condition, and the structures involved; this varies considerably in different cases. The anterior vaginal wall may be redundant and simulate a cystocele in appearance when in reality the lesion is nothing more than an overstretching of

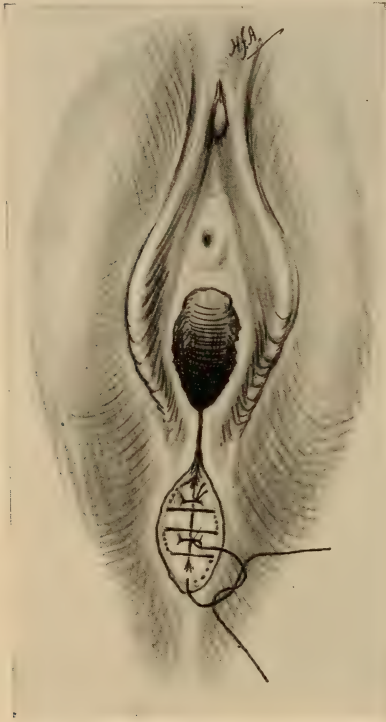


FIG. 210.—Completion of the subcuticular suture of either the Emmet or Hegar perineorrhaphy. The end of the subcuticular suture is tied to the last crown suture. The knot is buried.

the vaginal mucosa and a separation of it from the underlying tissues. Or in connection with a stretching and a separation of the vaginal wall there may be an actual rupture of the muscular and fascial supports of the vesical trigone, an overstretching or a tearing of the fascia that runs between the bladder and the vagina from the cervix to the pubes (pubo-vesico-cervical fascia "bladder pillars"), or an extensive separation of the normal attachment of the bladder to the cervix.

While the simplest of these conditions requires nothing more than a resection of the redundant vaginal mucosa, the more complicated cases demand, in addition, a reduplication of the under surface of the bladder, a reuniting of the torn muscles and the fascia that support the bladder, and a reestablishment of the normal relations of the bladder to the cervix. Many operations have been devised to meet these requirements.

Cystocele Operations—Martin's Operation.—Martin's operation is the simplest form of anterior colporrhaphy and cystopexy, and is applicable only to small cystoceles. The operation consists of outlining

an oval area upon the anterior vaginal wall, the longest diameter of the oval being in the median line. After removing the mucosa by means of tissue forceps and scissors, the adjacent areas on either side of the median line of the denuded oval are brought together by sutures introduced from side to side, through the vaginal wall.

Sänger's Operation.—This type of operation is performed in all but the simplest cases, and was first elaborated by Sänger. By means of a tenaculum the anterior vaginal wall is caught in two places—posteriorly, just in front of the cervix, and anteriorly, 1 cm. below the urinary meatus. The amount of redundancy of the anterior vaginal wall is determined by approximating, with tissue forceps, the vaginal tissues to either side of the median line, and then outlining the area with a knife. An incision is now made in the median line, from one tenaculum to the other, and the plane of separation between the

anterior vaginal wall and the bladder determined by blunt dissection. The anterior vaginal wall is separated from the base of the bladder on each side

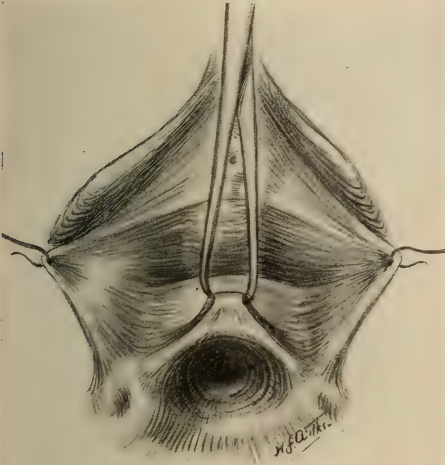


FIG. 211.—Operation for complete tear of perineum. The apex of the rectovaginal tear is held up by a tenaculum. The sphincter pits are shown.

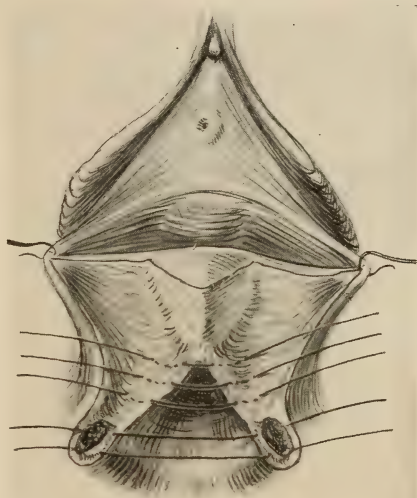


FIG. 212.—Operation for complete perineal tear. The sphincter ends have been dissected; the denuded surfaces comprise the sphincter areas, the margin of the rectovaginal septum, the vaginal sulci, and the perineal body; the upper part of the denudation is after the Emmet perineorrhaphy.

of the median incision as far as the lateral outlines and then excised (Fig. 215).

The exposed base of the bladder is infolded by interrupted or running catgut sutures. The vaginal wall and the pubo-vesico-cervical fascia are brought together in the median line by continuous or interrupted catgut sutures (Figs. 216 and 217).

The extent of this operation can be varied to suit the degree of relaxation that is present. When the cystocele is large, an inverted T-shaped incision should be made (Fig. 218). The dissection between the bladder and the vagina should be continued posteriorly as far as the cervix; the bladder is separated from the cervix and pushed up (Fig. 220). The pubo-vesico-cervical ligaments ("bladder pillars") and the cardinal ligaments are exposed and developed by blunt dissection (Fig. 221). The cardinal ligaments and the pubo-vesico-cervical ligaments are united to each other and to the cervix in the median line beneath the bladder which is pushed up.



FIG. 213.—Suture of rectovaginal septum by linen introduced from the rectal side.

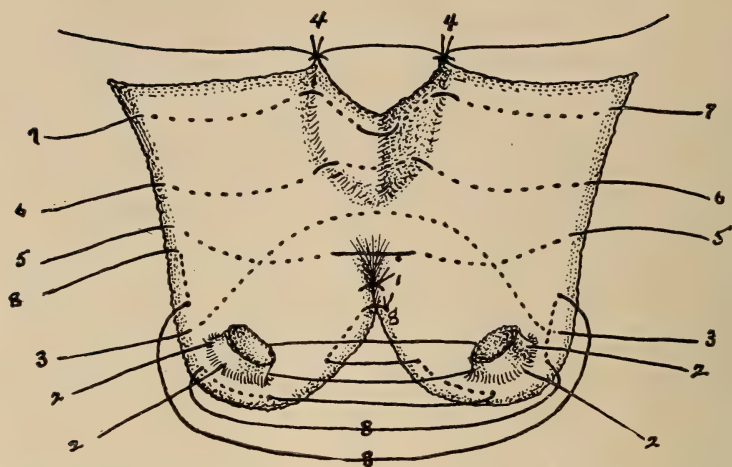


FIG. 214.—Operation for complete tear of perineum. Schematic diagram to show the introduction of the sutures. They are introduced in order as numbered. The end of the subcuticular suture, number eight, is continued forward to the junction of the perineal and vaginal surfaces where it is tied.

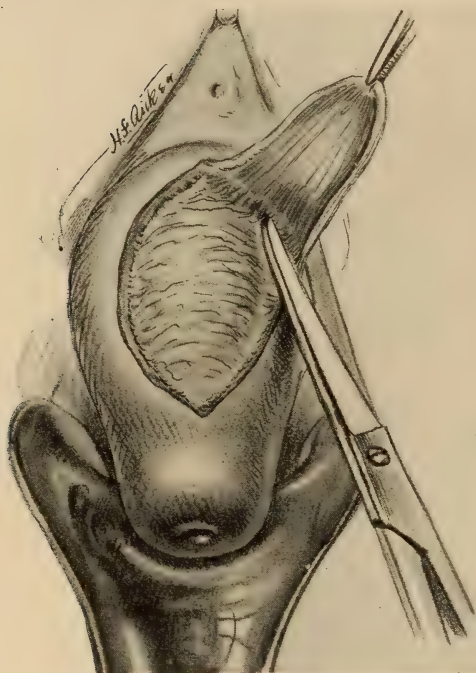


FIG. 215.—Sanger anterior colporrhaphy; the vaginal wall and underlying fascia corresponding to the area outlined are being cut away.



FIG. 216.—Sanger anterior colporrhaphy; the suture is started at the anterior end of the incision on the vaginal surface; it embraces in each turn the fascia beneath the mucosa and the wall of the bladder. Each transverse passage of the suture is half-hitched in order to prevent antero-posterior shortening; this suture is continued to the posterior limits of the denudation.

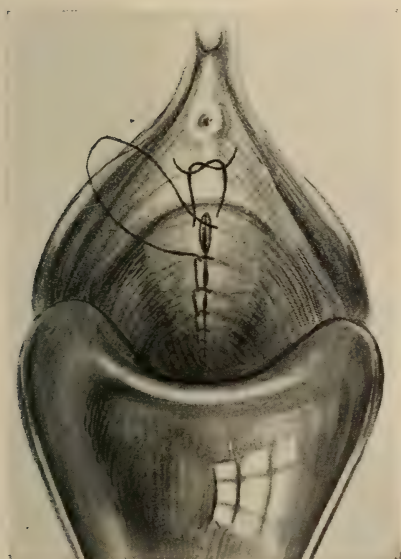


FIG. 217.—Sänger anterior colporrhaphy. At the posterior limit of the incision the suture is carried through the vaginal wall and then continued toward the starting point, each transverse passage catching the entire thickness of the vaginal mucosa and underlying fascia, and each one-half hitched to prevent antero-posterior shortening. When the suture reaches the anterior limits of the vaginal incision it is tied. One strand of No. 1, ten-day gut, one knot.

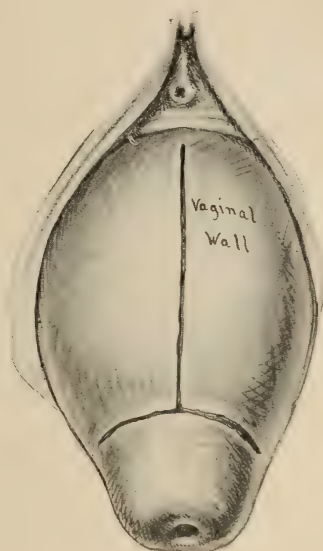


FIG. 218.—Anterior colporrhaphy or cystopexy. Outline of initial incision in advanced cases.

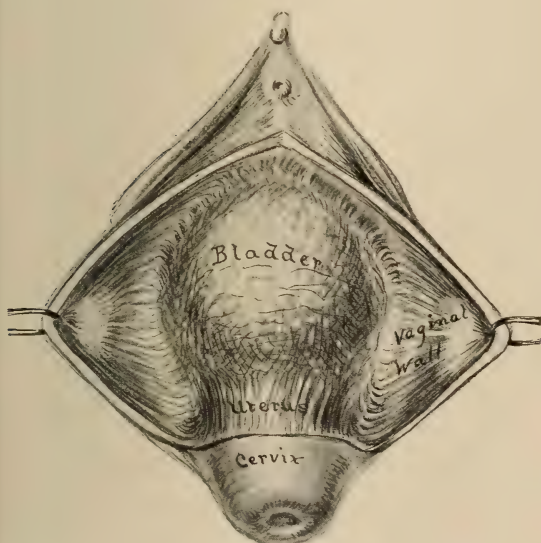


FIG. 219.—Anterior colporrhaphy or cystopexy. Exposure and separation of bladder from anterior vaginal wall and the cervix.

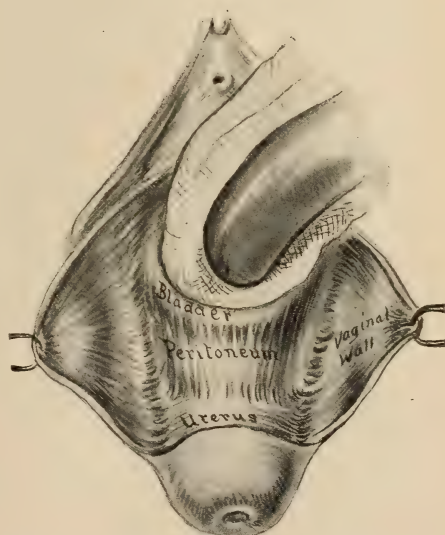


FIG. 220.—Anterior colporrhaphy or cystopexy. Further separation of bladder from uterine wall, exposing vesico-uterine fold of peritoneum, bladder pillars and cardinal ligaments.

Even in extensive cases this plan of operation will be satisfactory. If, however, the patient has passed the child-bearing period, other measures may be adopted that are more efficient, but partially or wholly incompatible with subsequent pregnancy and labor. One of these procedures consists of separating the bladder from the cervix beyond the uterovesical fold of the peritoneum; the bladder is then pushed up and its base united to the anterior surface of the body of the uterus above the internal os; the bladder pillars and cardinal ligaments exposed on each side are brought together in the median line and attached to the anterior surface of the uterus below the

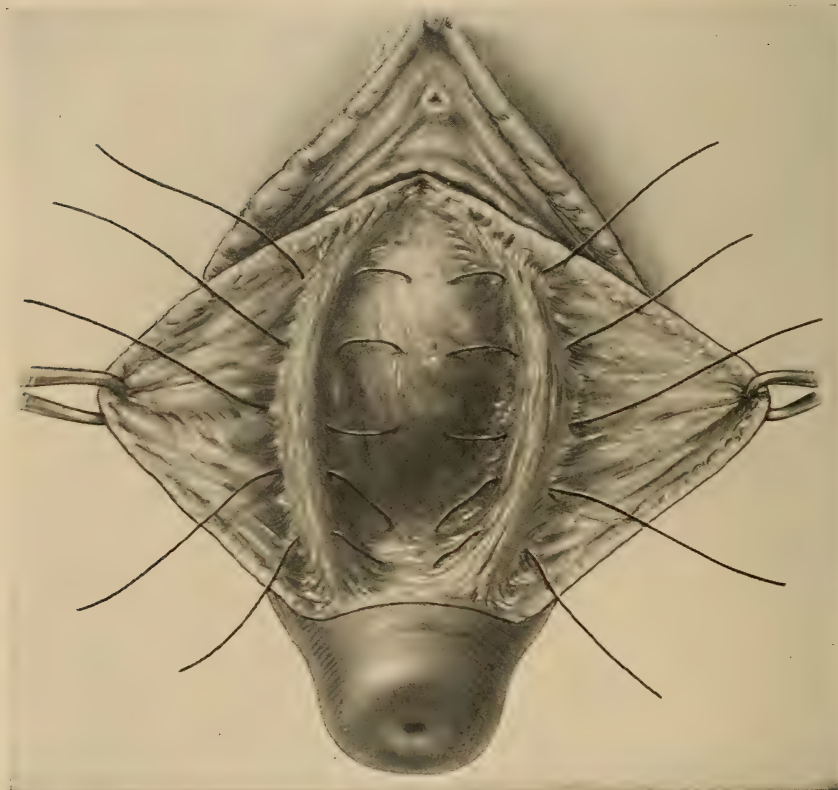


FIG. 221.—Anterior colporrhaphy or cystopexy. Introduction of sutures, fixing the pubo-vesico-cervical fascia, "bladder pillars," and the cardinal ligaments to the cervix at the position of the internal os, and bringing the fascia together beneath the bladder.

bladder; the edges of the posterior extremity of the vaginal incision are now united by means of sutures to the cervix at about the position of the internal os.

In very marked cases of cystocele Goffe sutures the base of the bladder to the uterus in the median line and laterally to the broad ligaments. The line of attachment on the bladder is selected, so that all bulging downward is eliminated.

Watkins' Interposition Operation.—In the case of very large cystoceles, in women past the menopause, the plan of operation elaborated by Watkins

is the procedure of choice. In this operation the body of the uterus is interposed between the base of the bladder and the anterior vaginal wall. This method is applicable without modification only when the uterus is

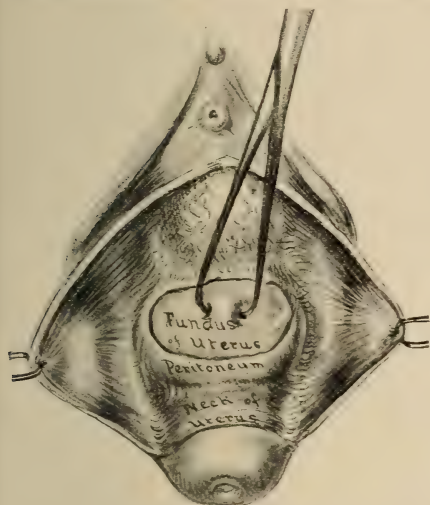


FIG. 222.—Interposition operation for prolapse. For steps in operation preliminary to this, see Figs. 218, 219, 220. The vesico-uterine fold of peritoneum is split transversely and the fundus of the uterus pulled through the opening.

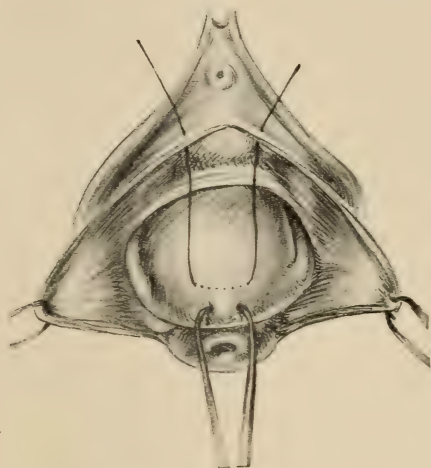


FIG. 223.—Interposition operation. The bladder has been pushed up, the vesical peritoneum has been united to the posterior surface of the uterus at the internal os, and the fundus is being anchored to the fascia bordering the anterior extremity of the vaginal incision; the uterine body in this way is brought to lie beneath the bladder, between it and the vagina.

small and freely movable, and when the adnexa are perfectly healthy. (See also pages 272 and 273.) After exposing the uterovesical fold of peritoneum the latter is divided transversely, opening the peritoneal cavity. The vaginal walls should be separated from the bladder somewhat extensively on either side of the median line. The fundus of the uterus is pulled forward through the peritoneal incision (Fig. 222), while the base of the bladder is pushed upward so that the posterior surface of the uterus supports it. The upper edge of the vesico-uterine fold of peritoneum is attached to the posterior surface of the uterus somewhat above the position of the internal os. Sutures are passed between the anterior surface of the uterus and the adjacent margins of the pubo-vesico-cervical fascia, triangular ligament and vaginal walls (Fig. 223); these fix the uterus in its new position (Fig. 224). The redundant portion of the vaginal mucosa is trimmed off, and the edges are united in the median line by continuous or interrupted catgut sutures.

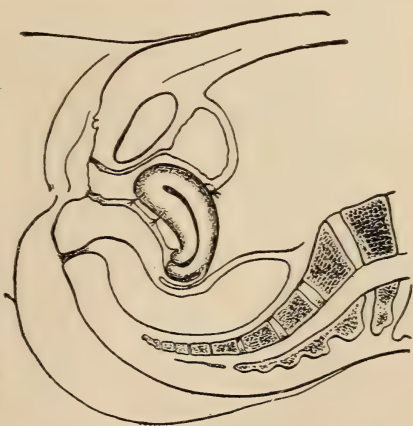


FIG. 224.—Schematic sagittal section, showing result of interposition operation.

BIBLIOGRAPHY

- ANSPACH, B. M.: "Buried Catgut and Subcuticular Stitch in Plastic Operations on the Perineum." International Clinics, vol. iv, eighteenth series, 1908. J. B. Lippincott, Phila. and London.
- BABCOCK, W. W.: "Submucous Perineorrhaphy." J. A. M. A., May 15, 1909, p. 1568.
- EMMET, T. A.: "A Study of the Etiology of Perineal Laceration, with a New Method for Its Proper Repair." Trans. Amer. Gyn. Soc., 1883, vol. viii, p. 198.
- FRANK, R. T.: "A Study of the Anatomy, Pathology and Treatment of Uterine Prolapse, Rectocele and Cystocele." Surg., Gyn. and Obst., 1917, vol. xxiv, pp. 42-58.
- GOFFE, J. R.: "An Improved and Perfected Operation for the Relief of Extreme Cases of Procidentia, Cystocele, and Rectocele." Am. Jour. Obst., 1910, vol. lxii, p. 611; *Ibid.*: "Operation for Extreme Cases of Procidentia, with Rectocele and Cystocele." Trans. Amer. Gyn. Soc., 1912, vol. xxxvii, p. 394.
- GOLDSPOHN: "Fundamental Intrapelvic Perineorrhaphy." Trans. Sect. O. G. and A. S., A. M. A., 1914, p. 273.
- HADRA: "Remarks on Vaginal Prolapse, Cystocele, and Rectocele." Amer. Jour. Obst., May, 1889, vol. xxii, No. 5, p. 457.
- HIRST, B. C.: "The Technic of Pelvic Floor Repair." Ann. Surg., Phila., 1916, lxxv, 247.
- KELLY, H. A.: "The Operation for Complete Tear of the Perineum." Amer. Jour. Obst., 1899, vol. xl, No. 2.
- NÖBLE, C. P.: "A Contribution to the Technic of Operations for the Cure of Laceration of the Pelvic Floor in Women." Amer. Gyn. and Obst. Jour., April, 1897; *Ibid.*: Plastic Operations. Kelly-Noble, vol. i. Saunders, Phila., 1907.
- SÄNGER, MAX: "Zur Technik der Prolapsoperation." Centralbl. f. Gynäk., 1898, vol. xxii, p. 33.
- SAVAGE: "The Surgery, Surgical Pathology, and Surgical Anatomy of the Female Pelvic Organs," 2nd Ed., London, 1870.
- SIMS, M.: Sims' Uterine Surgery, 1886, p. 205. Wm. Wood & Co., New York.
- STUDDIFORD, W. E.: "The Involuntary Muscle Fibers of the Pelvic Floor." Trans. Amer. Gyn. Soc., 1909, vol. xxxiv, p. 759.
- WARD, G. G.: "An Operation for the Cure of Rectocele and Restoration of the Function of the Pelvic Floor." Trans. Amer. Gyn. Soc., 1913, vol. xxxviii, p. 169; *Ibid.*: "The Problem of the Cystocele." Amer. Jour. Obstet., 1919, vol. lxxix, No. 5.

CHAPTER XIV

DISEASES OF THE CERVIX

Atresia of the cervix, in the vast majority of cases, is congenital, and manifests itself at puberty. Rarely, it may be acquired. A certain amount of stenosis of the cervical canal always occurs after the menopause. This may be complete, but, as a rule, a fine probe can be introduced. Actual atresia that obstructs the menstrual flow may be the result of cervix operations, especially trachelectomy, the application of caustics, or decubitus ulcerations that have destroyed the mucosa. Atresia of the cervix during the reproductive period leads to retention of the menstrual fluid and the production of hæmatometra, pyometra, or physometra.

In patients approaching the menopause, atresia combined with intra-uterine collections of blood and pus is often indicative of malignant growths affecting the cervix or the body of the uterus. Acquired atresia of the cervix may be accompanied not only by hæmatometra, but also by hæmatosalpinx. The symptoms vary. When it occurs during the reproductive period, there is recurring monthly distress, with little or no bloody discharge and the gradual enlargement of the uterus. In atresia appearing after the menopause, there are no symptoms unless the uterine cavity is the seat of carcinoma or sarcoma, when the bloody discharge cannot escape, and there is the gradual formation of an hæmatometra or a pyometra. (See Chapter XVI.) The diagnosis is established by the passage of a probe, if necessary, under anæsthesia.

In non-malignant cases the treatment consists in relieving the obstruction by forcibly dilating the cervix, and performing such other operative treatment as may be required, which is described under gynatresia. In malignant cases the establishment of drainage is the first indication, to be followed by pan-hysterectomy if the case is operable.

Endocervicitis.—Hyperplasia of the cervical mucosa may be the result of mechanical irritation after laceration and eversion of the cervical lips. Under such circumstances the lesion consists of a hypertrophy of the cervical glands, the discharge being a hypersecretion. Actual infection of the cervix occurs in acute gonorrhœa and in post-partal, post-abortion, and post-operative infections. The acute disorder is usually accompanied by lesions that greatly overshadow it in importance, as, *e.g.*, an acute endometritis, metritis, or cellulitis, or it may be but one of an associated series of lesions, as in gonorrhœa. A discussion of the acute cervical infections will be found under the head of Gonorrhœa, Chapter XXIX, and Pelvic Inflammatory Disease, Chapter XXI, to which the reader is referred.

We are concerned here only with chronic cervical infections. This is most frequently of gonorrhœal origin. A staphylococcus or a streptococcus infection, once the acute attack is over, rapidly subsides and gives little further trouble except in so far as it leaves behind tissue that has been either altered in form or permanently injured. The infectious agent, however, disappears.

Chronic gonorrhœa of the cervix may, on the other hand, be exceedingly resistant to all forms of treatment, and may remain partially latent, but none the less infectious, for many years. In many cases the gonococcus is most difficult to find, and no history of gonorrhœal infection or exposure can be elicited. In some of these cases it is possible that the original infection took place during infancy.

Chronic endocervicitis is evidenced by a thick, mucopurulent discharge, and an erosion of the mucosa about the external os. The more chronic the condition, the fewer in number the pus-cells, and in old cases that persist because of the hypertrophy that remains as the residuum of the previous inflammation, the discharge may consist almost entirely of mucus. Careful and repeated examinations of smears, however, made just before or just after menstruation, will usually show the presence of pus-cells and of gonococci.

In addition to the discharge, which may be so profuse as to require the patient to wear a perineal dressing to protect the clothing, the menstrual



FIG. 225.—Cervical polyp of large size projecting from the external os.



FIG. 226.—Cervical polyps, showing origin from mucous plicæ of the cervix.

periods may be profuse and painful, and the patient may complain of a sense of weight and discomfort in the pelvis.

The treatment should be directed toward establishing complete and easy drainage, and the employment of suitable disinfecting solutions. In the nulliparous woman, when the external os is constricted and the cervical canal becomes filled with the thickened secretion, it will be found advantageous to split the lips of the cervix so as to expose the entire mucosa, thus insuring free drainage and permitting applications of disinfecting solutions to be made.

The cervical mucus should be coagulated or toughened by applying a solution of silver nitrate, when it may be withdrawn from the canal with a dressing forceps. Another method is to dissolve the cervical mucus by applying a 10 per cent. solution of sodium hydroxide. The mucosa being exposed, the disinfecting agent is then applied directly. Pure phenol, followed by alcohol and silver nitrate (10 to 20 per cent.) followed by salt solution, are the most effectual means of disinfection. Tincture of iodine, pure ichthyol or argyrol, 25 per cent., may also be tried. Such applications

should be followed by the introduction of tampons medicated with ichthyol, 25 per cent. in petrolatum.

After the tampons have been removed, hot douches should be administered, and the treatment repeated three times a week. Under this method the discharge will usually subside. In obstinate cases operative treatment will be required. Curettage of the endometrium and cervix, together with the application of pure phenol, followed by alcohol, may be sufficient. If,



FIG. 227.—Elongation and hypertrophy of cervix resembling prolapsus uteri.

however, the cervical lips are hypertrophied or are the seat of Nabothian cysts, amputation should be performed. (See also Gonorrhœa, Chapter XXIX, for prognosis.)

In obstinate endocervicitis Hunner recommends linear cauterization of the cervical mucosa with the electric cautery. Destructive cauterization of this type or deep cauterization by means of powerful chemicals is objectionable because of the scar tissue and stenosis that are prone to ensue.

Cervical Polyp.—Polypoid outgrowths may occur from the mucous mem-

brane of the cervix, varying in size from that of a pea to an English walnut. These little tumors are composed of a fibrous tissue stroma and contain glands that resemble those of the cervical mucous membrane (Fig. 225). The growths are, as a rule, pedunculated. They begin as localized hypertrophies of the mucosa that gradually increase in size and become pedunculated (Fig. 226). The polyp may be entirely concealed within the cervical canal, or it may present at the external os or project from the cervix into the vaginal vault. Small polyps springing from the cervical canal are usually covered with high columnar epithelium; those originating about the external os may exhibit surface epithelium of the squamous type. When the polyp is large and projects from the cervix, the surface epithelium is usually rubbed off by contact with the vaginal vault. If the polyp springs from the mucosa near the position of the internal os, the tumor may contain glands that resemble those of the endometrium more than those of the cervical mucosa. Polyps of considerable size are often extruded from the cervical canal, in which event the stretching of the pedicle may interfere with the blood supply of the growth, resulting in necrosis and gangrene.

The symptoms consist of the discharge of a thick, mucilaginous secretion, occasionally streaked with blood, increased menstrual flow, and intramenstrual hemorrhage following defecation, coitus, or vaginal irrigations. The diagnosis is easily made: on exposing the external os a bright red tumor, varying in size from a pea to a walnut, will be seen projecting from, or lying within, the orifice. Rarely it may be necessary to dilate the external os before the polyp can be brought into view.

The tumor may be grasped with forceps and removed by torsion or avulsion of its pedicle, or, if the pedicle is accessible, it may be ligated and the tumor removed with scissors. As these polyps not infrequently display a tendency to undergo malignant change, it is usually advisable, except in very young women, to administer a general anæsthetic, and, after removing the polyp, curette the entire uterus thoroughly, and examine both the polyp and the endometrial scrapings microscopically.

Cancer of the Cervix.—See Cancer of the Uterus.

Atrophy of the Cervix.—See Malformation of the Cervix.

Myomata of the Cervix.—See Myomata of the Uterus.

Stenosis of the Cervix.—See Pathologic Antelexion of the Uterus.

Tuberculosis of the Cervix.—See Tuberculosis of the Pelvic Organs.

LACERATIONS OF THE CERVIX

Pathology.—A tear of the thinned-out rim of the cervix occurs almost invariably during the first stage of labor. Although the laceration is not, as a rule, very extensive and heals without leaving any ill effects, some widening of the external os and slight exposure of the cervical canal generally occur. Furthermore, in a woman who has borne children it is nearly always possible to detect scars upon the cervix (Figs. 228 to 231). Lacerations of the cervix usually take place to one side of the os, in the plane between the anterior and the posterior lip. A tear may affect only one side (unilateral) or both sides (bilateral) may be involved. Bilateral lacerations

may be accompanied by tears involving the anterior or the posterior lip, the combined laceration being designated as stellate (Fig. 232). In many instances extensive lacerations of the cervix are the evidence that forceps operations were undertaken without full dilatation of the cervix.

When the laceration is bilateral or stellate, or unilateral and deep, the lips of the cervix are inclined to separate, somewhat like the split end of a stalk of celery (eversion) (Fig. 233). This separation of the cervical lips

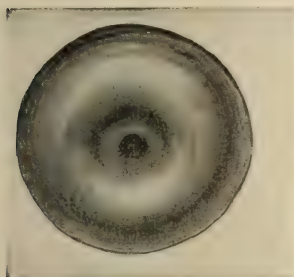


FIG. 228.—Nulliparous cervix.

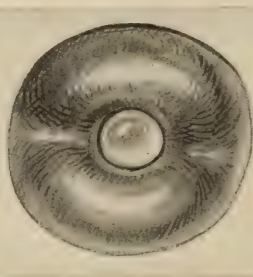


FIG. 229.—Parous cervix; well healed bilateral laceration, plug of mucus in cervical canal.

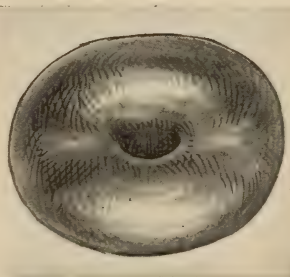


FIG. 230.—Parous cervix; well healed bilateral laceration.

tends to prevent healing by first intention and granulation, and the entire or the greater extent of the wound undergoes cicatrization. This results in more or less permanent alteration in the shape of the cervix: the cervical lips remain separated, mucous membrane from the vaginal surface of the cervix or from the cervical canal grows over the lacerated surfaces, and a considerable amount of scar tissue is formed beneath the mucosa, especially at the angles or at the upper limits of the laceration.



FIG. 231.—Deep unilateral laceration with irregular tag of cervical tissue.

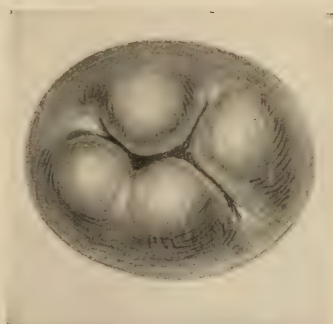


FIG. 232.—Stellate laceration.

As a consequence of the permanent eversion the cervix is increased in its anteroposterior diameter, and the cervical canal is exposed (Fig. 234).

The exposure of the cervical mucosa and the traumatism to which it is subjected, especially if there is associated prolapse of the pelvic floor or displacement of the uterus, result in an irritation and hypersecretion of the cervical glands—the so-called “catarrh of the cervix.” In many instances a low-grade inflammation of the mucous membrane is present, accompanied

by occlusion of the gland-ducts and the formation of small growths which are known as Nabothian cysts. These vary in size from a pinhead to a pea, and rarely may be a centimeter or two in diameter (Fig. 235).

Accompanying low-grade inflammation of the cervical mucosa there is often hypertrophy of the fibromuscular tissues of the cervix, which is par-

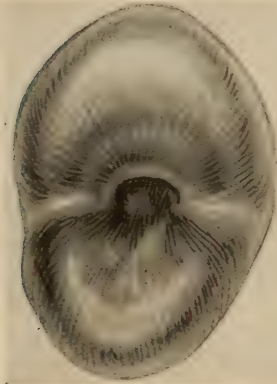


FIG. 233.—Deep bilateral laceration with unequal division of cervical lips; eversion.



FIG. 234.—Deep bilateral laceration with eversion of lips, cystic degeneration and hypertrophy.

ticularly apt to be marked when Nabothian cysts are present (Fig. 234).

Thus, in the course of events, and solely as the result of a laceration, the cervix may become considerably increased in size and in density. As the result of walking, defecation, urination, etc., the epithelium of the exposed surface may be rubbed off from certain areas that come in contact with the

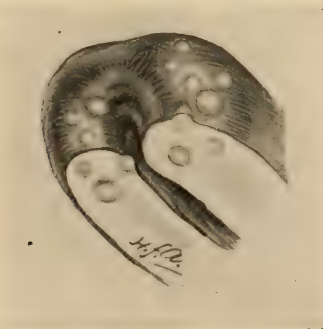


FIG. 235.—Nabothian cysts of cervix.

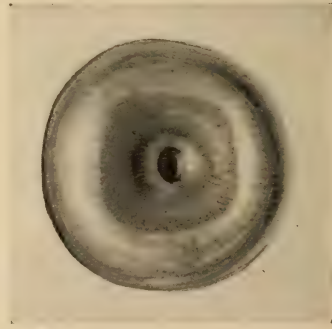


FIG. 236.—Nulliparous cervix, extension of cervical mucosa beyond external os to vaginal surface of the cervix. The so-called erosion of Ruge and Veit.

vaginal mucosa. This condition is known as erosion. As a rule, it is merely superficial, but in cases of prolapse, when the cervix projects from the vaginal introitus, it is exposed to external trauma and deep ulcers (decubitus) may form.

Hypertrophy of the Cervix.—Although hypertrophy of the cervix is usually a sequel of laceration with eversion and low-grade infection, it may be due to other causes. Among these may be mentioned chronic endocervicitis with cystic distention of the glands, and displacement of the cervix, as in prolapse, with its resulting circulatory disturbance and exposure to trauma (Fig. 234).

In some cases of prolapse hypertrophy, especially elongation, is more apparent than real. Inversion of the vaginal fornices and their close application to the descending uterus may resemble a true hypertrophic elongation, but if the patient is placed in the knee-chest position and the uterus is displaced upward toward the abdominal cavity, the actual length of the vaginal portion of the cervix can be determined by inspection of the vaginal fornices.

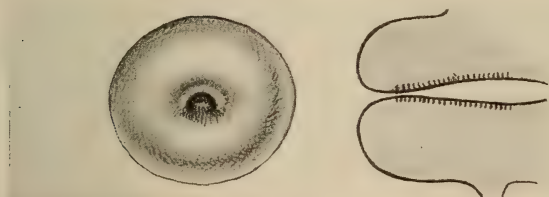


FIG. 237.—Nulliparous cervix. No erosion and no laceration. The cervical mucosa is not exposed.

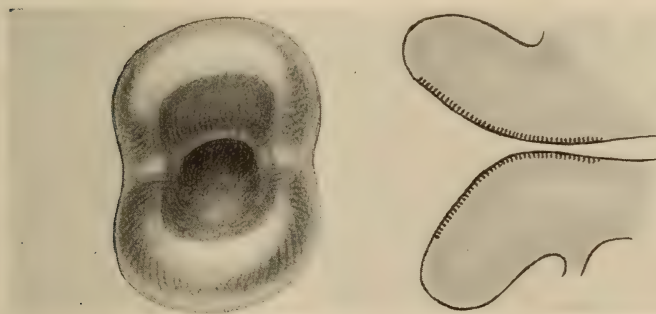


FIG. 238.—Parous cervix. Deep bilateral laceration with eversion of the cervical lips and exposure of the cervical mucosa.

Hypertrophic elongation of the vaginal cervix is occasionally observed in uninfected nulliparous women. The cervix projects well into the vagina, and may even present at the vaginal outlet (Fig. 227); when this occurs, inspection of the presenting part reveals nothing abnormal beyond elongation; *i.e.*, the distance from the os to the vaginal fornices is considerably increased. The vaginal fornices maintain their original position, and the hypertrophic elongation affects the cervix below its vaginal attachment.

Symptoms and Results of Laceration of the Cervix.—The commonest symptom of a lacerated and everted cervix is a leucorrhœal discharge. This is somewhat thick and tenacious, and varies in amount, at times being scarcely more than noticeable, and at others being so profuse as to be a source of constant annoyance. When there is no infection it may

be made up of mucus alone, but when an infection exists it consists of mucus mixed with pus. When endocervicitis, Nabothian cysts, and hypertrophy complicate the laceration, the menses may be profuse and painful. As a matter of fact, lacerations of the cervix associated with hypertrophy and Nabothian cysts are frequently accompanied by displacement of the uterus and relaxation of the perineum, so that, in addition to the symptoms mentioned, the patient presents those of displacement and loss of support.

Diagnosis.—Upon inspection the rounded, knob-like normal cervix covered with mucous membrane of the same color as the vaginal vault is no longer visible, but in its stead the cervix is seen to be more or less elliptiform in outline; the anterior and posterior lips diverge, and the bright red mucosa of the cervical canal, which contrasts sharply with the duller hued mucosa of the vaginal cervix, is exposed (Fig. 239). At first sight, this presents the appearance of an ulcerating surface.

The cervix and vaginal vault frequently are bathed with a profuse discharge, which, if there is no infection, may be clear and gelatinous—pure mucus; or, if the opposite is true, it may be yellowish and almost entirely purulent. Sometimes the cervical mucosa has overgrown the angles of the laceration, so that many variations in the appearance of the cervix may occur. If there are Nabothian cysts (Fig. 235) sago- or tapioca-like bodies may be seen embedded in the cervix; these have a slightly bluish, translucent appearance, shimmering through the surface of the mucosa, and feeling like shot embedded beneath it.

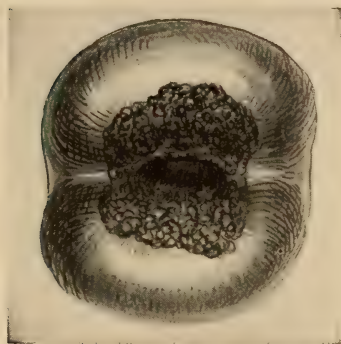


FIG. 239.—Deep bilateral laceration, with eversion of the cervical lips and exposure and inflammation of the cervical mucosa.

The formation of Nabothian cysts is frequently accompanied by hypertrophy, so that the cervical lips become enlarged and their density increased. When cystic degeneration is marked, eversion of the cervical lips and expo-

sure of the cervical mucous membrane are less noticeable; the outline of the cervix is rounded, but irregular, owing to the shot-like cysts, and the cervical tissue is very hard and sclerotic.

When badly lacerated and complicated by eversion and erosion, the cervix may, upon superficial examination, strongly resemble a beginning carcinoma or an ulcerative lesion of tuberculosis or syphilis. The exposed cervical mucous membrane may bleed slightly when touched by the finger or wiped with a pledget of cotton. Close inspection, however, will usually disclose the fact that the folds of the cervical mucous membrane are regular, and that the arbor-vitæ-like arrangement of the plicæ is preserved.

Actual destruction of the mucous membrane and of the underlying tissues by ulceration probably never occurs unless carcinoma, tuberculosis, or syphilis is present. As previously noted, an exception may be made in cases of laceration associated with marked descensus or prolapse, when there may be an ulceration that is clearly the result of the mechanical insults to which the cervix is subjected.

The true nature of bilateral laceration with eversion may be shown by grasping each lip of the cervix at the junction between the bright red and the duller mucous membrane, and bringing these points together (Figs. 240 and 241). This manœuvre temporarily restores the external os, and approximates the anterior and the posterior lip. It causes a disappearance of the bright red mucosa, and demonstrates that it is nothing more than the exposed membrane of the cervical canal. When the eversion is associated with hypertrophy of the cervical lips, this test will fail. In such cases the diagnosis of a benign condition may be assumed from the fact that the tissue is not friable and that stony induration is absent. Nabothian cysts

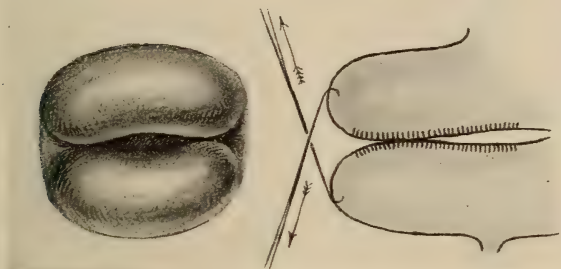


FIG. 240.—A test to show that the red, angry-looking surface is the cervical mucosa exposed by the eversion of the lips. Indication for trachelorrhaphy, not trachelectomy.

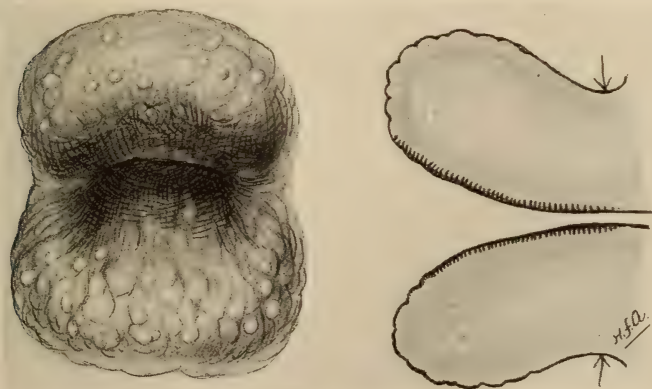


FIG. 241.—Deep bilateral laceration. Eversion of the mucosa. Nabothian cysts and exposure of the cervical mucosa. Amputation (trachelectomy), not repair (trachelorrhaphy), must be selected here.

are diagnosed by their appearance and by means of palpation; in doubtful cases the diagnosis can be confirmed by puncturing the cysts, when their contents will be at once expressed.

All lesions of the cervix of doubtful quality should be at once subjected to diagnostic curettage and excision of tissue. The technic of this procedure has been discussed elsewhere (page 121).

Treatment.—The treatment of laceration of the cervix, with or without eversion, cystic degeneration, or hypertrophy, depends upon the extent of the tear, the severity of the symptoms, the age of the patient, and the pres-

ence of associated lesions. In the active child-bearing period uncomplicated cases should receive only such local treatment as is required to render the patient comfortable. After the next puerperium trachelorrhaphy may be performed. In women approaching the menopause, a cervical disorder should be subjected to operation without delay. When operative treatment for other lesions of the reproductive organs or abdomen is required, a diseased cervix should receive surgical attention whether or not it is giving rise to acute symptoms. The symptoms of a diseased cervix (leucorrhœa, menorrhagia, dysmenorrhœa, etc.) may be so annoying and so little affected by palliative treatment that operation is indicated forthwith, whether further reproduction is contemplated or not.

Except where the indications for operation are urgent, it is a good plan to try palliative measures before resorting to operative treatment. Applications of Churchill's tincture of iodine, made directly to the cervix, followed by the introduction, into the vaginal vault, of boroglyceride tampons and the use of hot douches, may relieve the congestion and tend to lessen the discharge. Nabothian follicles that project prominently may be opened with a bistoury and their cavities swabbed with pure phenol. By this preparatory treatment the cervical tissues are placed in a condition that favors union by first intention after operation. Œdema, erosion, and cystic distention are temporarily relieved, giving the surgeon a better opportunity to estimate correctly the amount of tissue to be removed.



FIG. 242.—Trachelorrhaphy; repair. The apex of the angle of laceration on both sides is split to a point well above the scar tissue.

The operative treatment consists of performing either trachelorrhaphy or trachelectomy—the former when there is no disease of the cervical muscle itself and the cervical glands have not undergone extensive cystic degeneration, and the latter when the cervical lips are hypertrophied and cystic degeneration is marked. The operation of trachelorrhaphy (Figs. 242, 243, and 244) first reproduces the cervical laceration, and then reforms the cervix by uniting the torn surfaces. Trachelectomy (Figs. 245, 246, and 247), or amputation of the cervix, actually removes the hypertrophied and diseased parts of the cervical lips, forms a new external os, and shortens the entire cervix (Fig. 247).

Trachelorrhaphy is applicable only to lacerations that are accompanied by little or no hypertrophy, cyst formation, or infection of the cervix—in other words, to those in which a denudation of the original traumatized area and the introduction of sutures approximating the edges will restore the normal contour of the cervix. The actual removal of a part or of the entire cervix is demanded where trachelorrhaphy alone is not sufficient to remove the diseased tissue. Trachelectomy is also employed in connection with

operations for prolapse in women who have passed the menopause, in order to eliminate the cervix as a possible cause of recurrence. When it is allowed to remain, the cervix may act like the acorn tip on a bougie and serve to guide the uterus down through the vaginal tract. The removal of the cervix may, therefore, be one of the necessary operative measures selected in the treatment of prolapse.

Whenever possible, trachelectomy should be avoided during the child-bearing period, as it predisposes to abortion in subsequent pregnancies and to dystocia in subsequent labor. The preliminary treatment of a diseased cervix by the application of tampons, puncture of cysts, etc., will sometimes permit the surgeon to substitute trachelorrhaphy for trachelectomy.

Trachelorrhaphy.—This operation is performed as follows: After the customary disinfection of the operative area, the cervix is exposed with a Sims' speculum. The anterior and the posterior lip are each caught with a tenaculum in the median line, at a point that corresponds to the original location of the external os. The cervical lips are separated and the lacerated area is exposed. The area for denudation is now outlined by making an incision on either side of the median line of both lips, from the external os to the position occupied by the original external os (Fig. 242). The lines should be run parallel and be about one-quarter of an inch apart. They bound a strip of that width which is left undenuded, and which constitutes the lining of the reconstructed cervical canal. The parallel median incisions are continued from their anterior termination outward, along the border of the lacerated area to a point above its upper limit, the incision on the anterior and the one on the posterior lip joining on the lateral surface of the cervix, well above the angle of laceration, and close to the attachment of the vaginal fornix. The areas thus outlined are next denuded by means of tissue forceps and a scalpel or by sharp-pointed scissors. Particular care should be taken to remove all the tissue at the apices of the cervical tear. After a clean denudation on either side has been effected, sutures are introduced for the purpose of approximating the denuded areas of the anterior to those of the posterior lip. The first suture is introduced at a point directly opposite

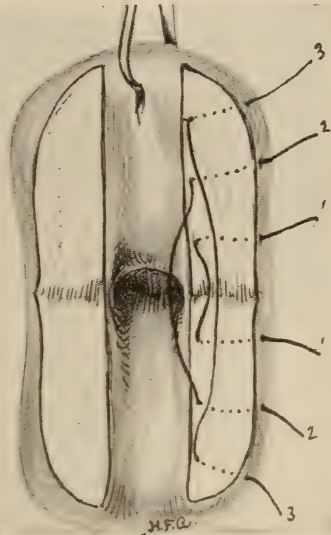


FIG. 243.—Trachelorrhaphy; repair. The cervical lips are denuded except for a strip of mucosa in the midline of each one at the site of the new cervical canal. The sutures are introduced as indicated.

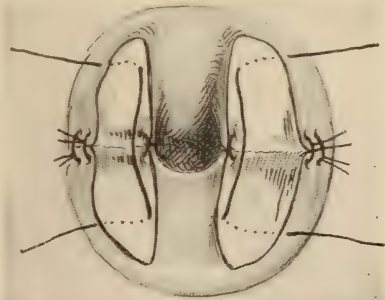


FIG. 244.—Trachelorrhaphy; repair. The two upper sutures are tied; the everted lips are being approximated. The cervical canal has been almost entirely restored.

the upper limit of the denudation. The needle is inserted into the mucous membrane of the vaginal surface of the cervix, being carried under the denuded area of the posterior lip, and emerges just on the border of the undenuded strip that is to form the new cervical mucosa. It is reintroduced at a point opposite on the anterior lip, and carried through in a reverse direction to a corresponding point (Fig. 243). A succession of sutures is introduced from above downward until the entire length of the denuded area is approximated. After the sutures have been placed on one side, the same method is pursued upon the other. No sutures are tied until all have been introduced. The anterior and posterior lips of the cervix should be approximated with only slight tension. When the sutures are tied, the external shape of the cervix will have been restored to its original form, the exposed

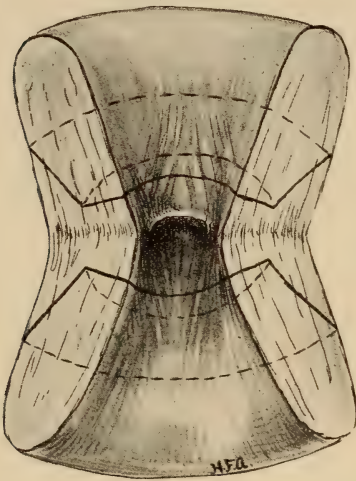


FIG. 245.—Trachelectomy; amputation of cervix, showing the cervical lips split laterally to the level of the proposed amputation; lines of excision of the cervical lips outlined.

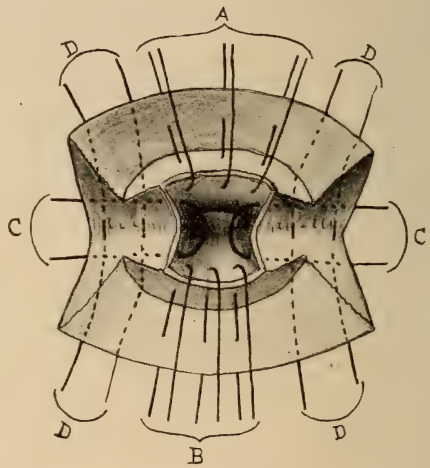


FIG. 246.—Trachelectomy; amputation of cervix. The cervical lips have been excised; flaps must now be brought together with sutures, so passed that there will be a new external os and that all raw surfaces will be covered. The groups of sutures are passed as marked alphabetically.

and everted mucous membrane will no longer be visible, and the external os will be in its normal position (Fig. 244).

Trachelectomy.—For the operation of trachelectomy the cervix is exposed, and each lip is caught with a tenaculum. The cervix is then pulled down, and an estimate is made of the amount of tissue to be removed. When considerable hypertrophy is present, and especially if the condition is associated with a marked descensus or a prolapse, a high amputation is performed. If, however, the patient is a young woman, and it is desirable to save as much of the cervix as possible, a low amputation is indicated. The difference between the two operations lies in the amount of cervical tissue that is removed, and in the position of the outer cervical incisions.

If a high amputation is to be done, the operation is begun by making an incision completely around the cervix, dividing the vaginal mucosa at the point where it is reflected from the vaginal fornices over the vaginal cervix.

After this circumcision the vaginal tissue is separated from its attachment to the cervix all around, and as high up as it is desirable to amputate. The cervix is then split laterally to the corresponding point, and by means of a wedge-shaped incision that forms an inner and an outer flap, each lip is removed.

In a low amputation the wedge-shaped incision and the formation of flaps are carried out without a preliminary detachment of the vaginal fornices from the cervix, the line of amputation falling well within the cervico-vaginal junction. Whichever form of operation is selected, the plan of introducing the sutures is about the same. The object is to cover the raw surfaces and fashion a new external os. The first suture is introduced in the median line posteriorly (Fig. 246), the needle being carried through the cervical mucosa, passing to the depths of the wedge-shaped incision, and withdrawn and then reinserted, passed through the remaining posterior part of the cervical lip, and, in the case of high amputation, additionally, the corresponding part of the posterior vaginal fornix. One suture

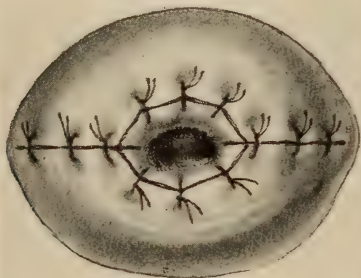


FIG. 247.—Trachelectomy; amputation of cervix. Sutures tied; there is now a new external os and all raw surfaces are covered.

is introduced on each side of this single median suture. Similar sutures are now introduced anteriorly, and the two sets together serve the purpose of uniting the mucosa of the vaginal surface of the cervix to the mucosa of the cervical canal, thus insuring the formation of an external os (Fig. 247). The lateral sutures are now introduced, their purpose being simply to approximate the raw areas on either side. The first suture is the uppermost, and extends from a point on the posterior lip immediately behind the upper limits of the excision, beneath the raw area of the posterior lip, into the cervical canal. From this point it is reintroduced through the cervical mucosa, and made to traverse the tissues of the anterior lip in an opposite direction. This suture approximates and embraces the depths of the cervical incision and is hæmostatic. The other lateral sutures are introduced in a corresponding manner, but in a more antero-posterior direction, care being taken to have them pass beneath all the raw tissue. No sutures are tied until all have been introduced, unless the hemorrhage is marked, when the hæmostatic suture may be tied at once.

active hemorrhage from the wounded branches of the uterine artery and vein. In passing the hæmostatic suture care must be taken lest the needle be passed so deeply as to catch the ureter. If the lines of incision are correctly placed, there is little tension on the sutures when they are tied.

BIBLIOGRAPHY

- EMMET, THOMAS ADDIS: "Surgery of the Cervix in Connection with the Treatment of Certain Uterine Diseases." *Am. Jour. Obst.*, 1869, vol. i, p. 339; *Ibid.*: "Laceration of Cervix as a Frequent and Unrecognized Cause of Disease." *Amer. Jour. Obst.*, November, 1874; *Ibid.*: "The Proper Treatment for Laceration of the Cervix." *American Practitioner*, 1877, vol. xv, p. 1.
- LEONARD, V. N.: "The Post-operative Results of Trachelorrhaphy in Comparison with Those of Amputation of the Cervix." *Surg., Gyn. and Obst.*, 1914, vol. xviii, p. 35.
- NOBLE, C. P.: "Ectropion of the Cervix in Nulliparæ Resembling Laceration of the Cervix." *Amer. Gyn. and Obst. Jour.*, February, 1897, p. 135.
- PENROSE, C. B.: "Congenital Erosion and Split of the Cervix Uteri." *Amer. Jour. Med. Sciences*, May, 1896, p. 503.
- SIMS, J. M.: "Amputation of the Cervix Uteri." *Trans. Med. Soc., State of N. Y.*, 1861, p. 367.

CHAPTER XV

CHANGES IN FORM AND POSITION OF THE UTERUS

Normally, the axis of the body of the uterus forms an obtuse angle with the axis of the cervix. The body of the uterus is flexed forward on the cervix; this is known as *anteflexion* (Fig. 248). If the conditions are reversed and the uterine body is bent backward on the cervix, the relation between the body and the cervix is known as *retroflexion*. When the axis of the entire uterus is turned forward, swinging on an imaginary transverse line passing through the cervix at the level of the internal os (Fig. 249), the uterus is said to be *anteverted* (Fig. 250). When the axis of the entire uterus is turned backward, the organ is said to be *retroverted* (Fig. 250).

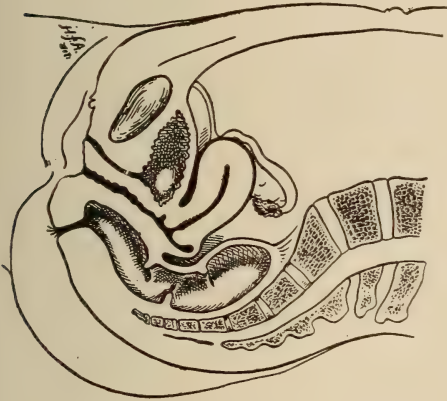


FIG. 248.—Diagrammatic sagittal section, showing normal anteflexion and anteversion of the uterus.

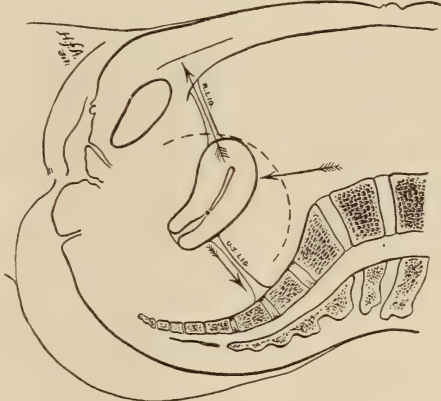


FIG. 249.—Schematic outline, showing arc of imaginary circle through which fundus moves during anteversion and retroversion; also the point at the internal os which represents the imaginary transverse axis on which the fundus rotates forward or backward. The pull of the round ligaments forward above the axis and the pull of the utero-sacral backward below the axis have the same effect on the uterus; it maintains anteversion.

Anteversion is usually combined with anteflexion, and both are normal; retroversion is usually combined with retroflexion, and both are pathological (Fig. 251). Occasionally anteflexion is so marked or is accompanied by such ill or faulty development of the cervix as to give rise to certain symptoms; this is known as pathologic anteflexion (Fig. 252). The uterus may also be latero-flexed or latero-verted, or both combined, as the result of faulty development, from the pressure of tumors, or from the tug of adhesions or thickened ligaments. Anteposition, retroposition, and right or left latero-position indicate total displacement of the uterus forward, backward, or to one side by pelvic tumors, exudates, or adhesions.

The uterus may be totally displaced downward. As soon as the uterus drops below its normal level in the pelvis the condition is termed *descensus uteri* (Fig. 253); when it drops further down, it is known as *prolapsus uteri*;

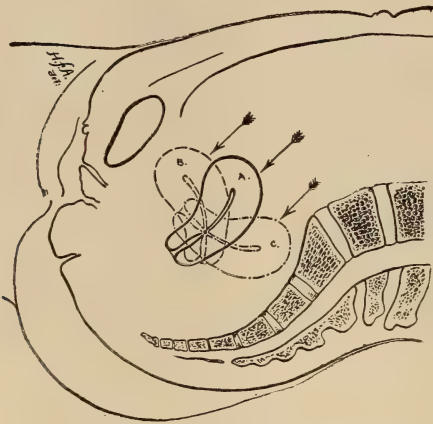


FIG. 250.—The normal position of the uterus (A); extreme anteversion (B), and retroversion (C). The uterus remains anteфлекed in all. The direction of intra-abdominal pressure is indicated by the arrows.

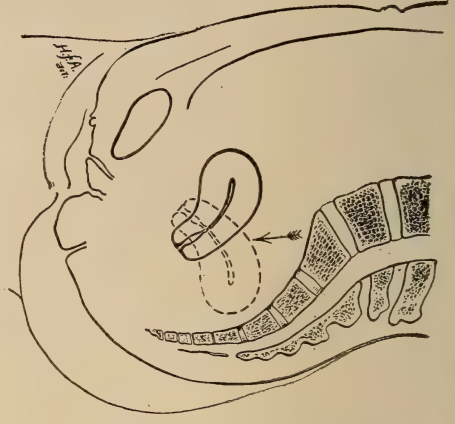


FIG. 251.—Retroflexion and retroversion of the uterus (broken lines). The uterus is turned backwards on the imaginary transverse axis passing through the cervix; the axis of the fundus is flexed backward on the axis of the cervix. Intra-abdominal pressure strikes the uterus on its anterior wall.

if the downward displacement is extreme, so that the uterus projects outside the body, the condition is known as *procidentia* (Fig. 285).

The normally anteverted and anteфлекed uterus does not commonly undergo downward displacement. Preceding descensus the axis of the entire uterus turns backward and corresponds more or less with the axis of the vagina. In some cases this retroversion is very slight, and the uterus may still be anteфлекed, but the uterine axis is sufficiently posterior to permit its descent.

The uterus may be entirely elevated above its normal position by the traction of adhesions or the growth of a tumor. It may also form part of the contents of a hernial sac.

The displacements of most practical interest and importance are pathologic anteфлекion, retroversio-fleckion, descensus, and prolapse. In other forms of displacement the position of the uterus is, with few exceptions, entirely secondary to the associated pelvic lesion, as, for example, anteponition from the

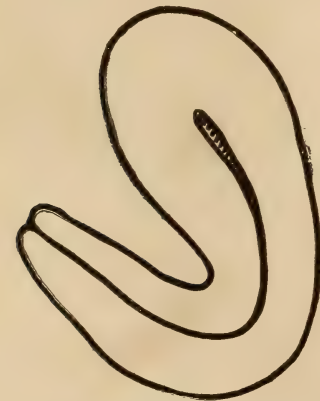


FIG. 252.—Pathologic anteфлекion with associated ill-developed cervix and narrow canal

occupation of Douglas' pouch by an ovarian cyst, or elevation of the uterus by the tug of a subperitoneal fibroid fixed above the pelvic brim.

PATHOLOGIC ANTEFLEXION OF THE UTERUS

Pathology.—Anteflexion is regarded as pathologic when it is of marked degree and accompanied with sufficient obstruction of the cervical canal to cause dysmenorrhœa and sterility (Fig. 252). At times the cervical canal is abnormally narrow, although the anteflexion of the uterus, as determined by bimanual examination, is not more marked than usual, and occasionally, even though the anteflexion seems more marked than normal, symptoms of obstruction may not exist. Cases of exaggerated anteflexion are usually

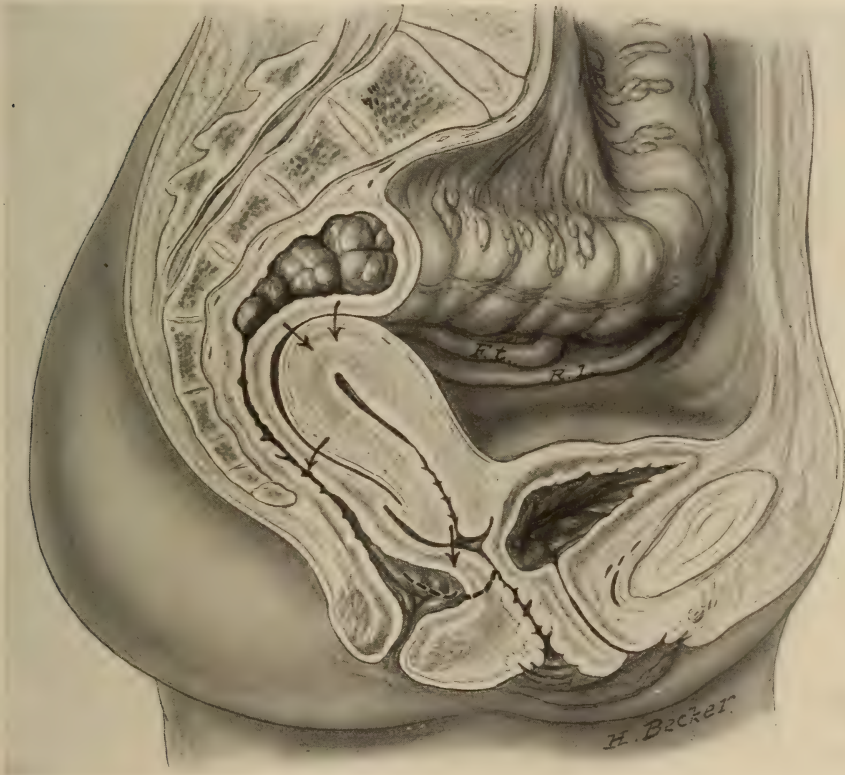


FIG. 253.—Retroversion. Slight flexion and descensus and beginning of prolapse: pressure on rectum; hemorrhoids and constipation. The pressure of the uterus on the rectum causes an accumulation of feces, and this in turn aggravates the descensus of the uterus. Rectocele and cystocele.

associated with shortness of the anterior wall (Fig. 255), a small uterus, and a long, conical imperfectly developed cervix. The ligaments of the uterus may be in a state of spastic contraction, whereby the strong forward pull of the fundus by the round ligaments, the traction backward of the uterosacral ligaments on the isthmus, and the forward fixation of the cervix by a short anterior vaginal wall combine to form an acute angle between the uterine cavity and the cervical canal. Furthermore, when this spasticity is relieved by anæsthesia, the degree of flexion is diminished and the amount of stenosis or obstruction of the cervical canal is less marked.

Symptoms.—The symptoms in pathologic anteversion may be due not only to obstruction of the cervical canal, but also, in part, to a faulty development of the uterine muscle (too great a proportion of fibrous tissue), or of its vascular and nervous supply (see Dysmenorrhœa). The condition is usually congenital, and the symptoms commonly appear with the onset of menstrual life.¹

The principal symptoms of pathologic anteversion are dysmenorrhœa and sterility. Pain begins a few hours to a day before the onset of the menstrual flow, and may be exceedingly severe for the first six to twelve hours of the flow, after which it gradually subsides. In addition to this form of pain, typical of obstruction, there may be the more continuous distress, lasting for several days, which is the result of an associated imperfect development of other pelvic structures. Similarly the

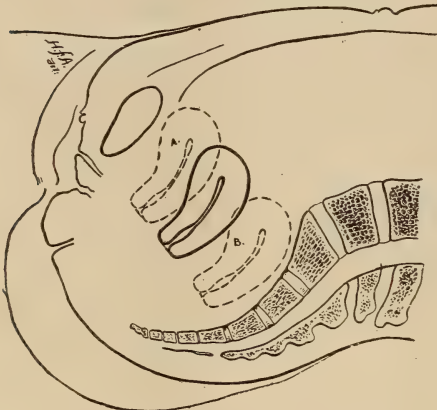


FIG. 254.—Schematic outline, showing uterus in normal position, ante-position and retroposition. There is no change in the normal anteversion or anteversion but the uterus is bodily pushed forward, (A) or backward, (B). This is almost always the result of pelvic tumors lying in front of, or back of, the uterus.

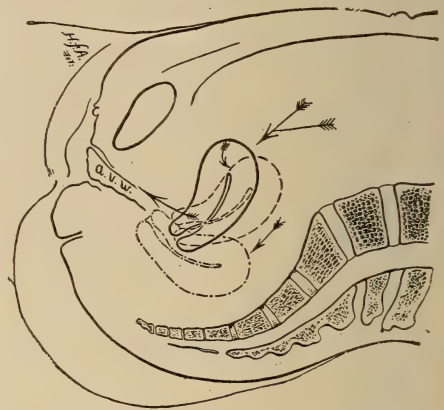


FIG. 255.—Schematic, outline showing the influence of a shortened anterior vaginal wall in the production of a retroflexio-version of uterus. Cervix pulled forward causes the uterus to turn backward on its transverse axis passing transversely through the cervix; as soon as the backward displacement begins intra-abdominal pressure strikes the anterior wall of the uterus and presses the fundus further backward.

sterility, although primarily ascribed to stenosis of the cervical canal, may be the result, in part, of faulty development of the uterine body, imperfectly developed ovaries, or abnormal tubes.

¹ Reynolds declares that in many cases of hypoplasia of the uterus—so-called infantile uterus—there is a corresponding lack of development of the anterior vaginal wall, and of a fascia, described by Goffe, which runs from the cervicovaginal attachment to the pubic arch on each side of the urethral canal. This is a Y-shaped ligament, which holds the cervix forward in its vaginal position. The uterosacral ligaments attached above this posteriorly pull back on the supravaginal cervix. The round ligaments tilt the fundus forward, thus producing angulation in the supravaginal cervix. When menstruation occurs, the uterus attempts to straighten out and relieve the angulation. This can occur only by relaxation of the yielding supports, *i.e.*, the round ligaments which are in part muscular.

To relieve this condition Reynolds proposes to lengthen the anterior vaginal wall by making a transverse incision in the vaginal mucous membrane, split the fascial bands of Goffe transversely, and suture the wound longitudinally. The cervix is then subjected to a Pozzi or a Dudley operation, or a simple splitting is performed, and the uterus suspended by a round ligament operation. This investigator makes a strong point of noting the motility or mobility of the cervix in such cases, and advises that this plan be followed in all such cases so that the cervix will drop back into the posterior vaginal fornix.

Diagnosis.—A simple digital vaginal examination shows the cervix to be well back in the vagina, small in size, and conic in shape, with a minute depression in its extremity that marks the site of the external os (Fig. 120). In front of the cervix, through the anterior vaginal wall, the angle of flexion between the body of the uterus and the cervix may at times be made out. The cervix points forward directly in the axis of the vagina. On bimanual examination the vaginal finger pressed upward from the anterior vaginal wall, and the abdominal fingers pressed downward above the symphysis palpate the body of the uterus in ante-flexio-version between them. The angle between the cervix and the body is markedly acute (Fig. 124). The entire uterus is small, or the body is disproportionately small, whereas the cervix is long and narrow. As a rule, the adnexa show no abnormalities.

Examination by the aid of a speculum confirms the existence of the conic cervix and the minute external os. The degree of stenosis of the cervical canal, and especially of the angle of flexion, is difficult to estimate without passing a sound, but this is usually unnecessary, since the diagnosis can be made from the symptoms and as the result of the examination previously detailed.

The diagnosis of pathologic ante-flexion and stenosis must sometimes be based on the symptoms, since the anatomic changes are not well marked. Given the symptoms of stenosis of the cervix, dysmenorrhœa, or sterility, even moderate alterations in form justify the diagnosis.

Prognosis.—The prognosis depends upon the effectiveness of the treatment in overcoming the cervical stenosis, as well as upon the associated conditions. The most effective method of overcoming cervical stenosis is by means of dilatation and the introduction of a cervical stem. If the symptoms are due to obstruction alone, the proportion of cures following this treatment will be large. If general ill development of the pelvic structures and other associated causes of dysmenorrhœa and sterility are present, the prognosis is doubtful. As it is difficult to make an exact differentiation in all cases, and impossible in some, the prognosis should always be guardedly

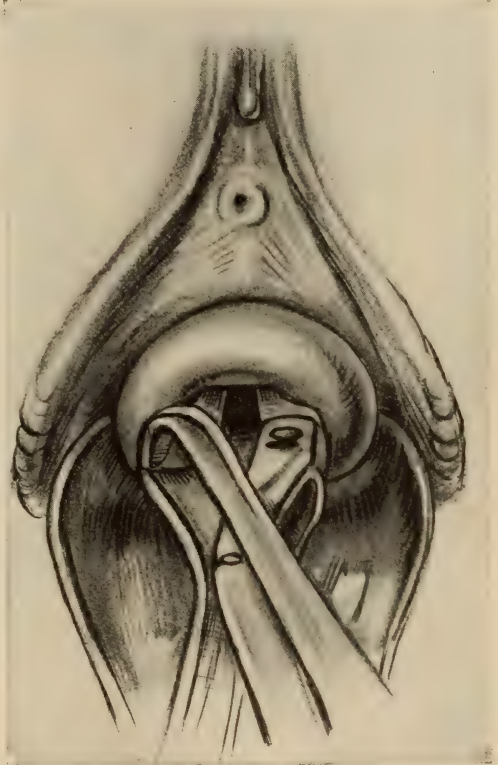


FIG. 256.—Divulsion of the cervix. Rapid, with branched metal dilators of Goodell.

favorable. In two-thirds of carefully selected cases, however, cures may confidently be expected.

Treatment.—The treatment of pathologic antelexion should be both general and local. General treatment is essential, since a depressed mental state may lead to an exaggeration of what may be termed normal menstrual distress. In a large number of healthy normal nulliparæ pain is present for a few hours at the beginning of the menstrual periods. This may be quite severe, but is not unbearable, and the patient may seek relief in a simple remedy, such as the local application of heat or a hot drink. In depressed conditions, on the other hand, a patient may find the menstrual distress unendurable, improvement again following a change of air and scene or pleasant recreation. It is desirable, therefore, to raise the general well-being of the patient to the highest degree by the administration of tonics, regula-

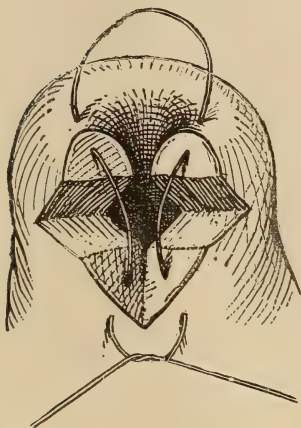


FIG. 257.—Dudley operation.

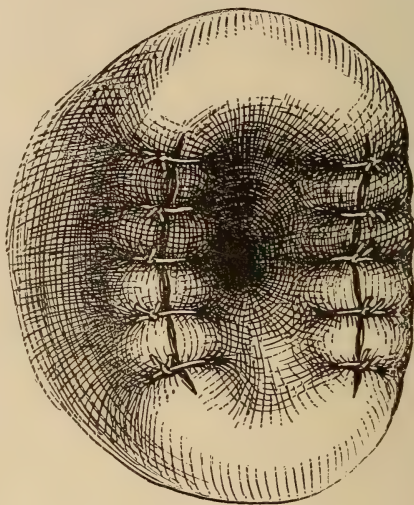


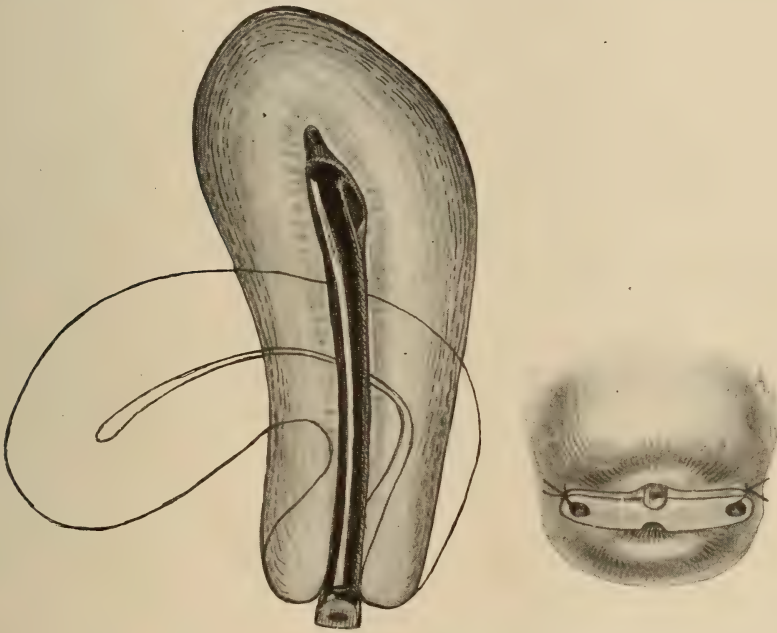
FIG. 258.—Pozzi operation.

tion of the bowels, careful oversight of the diet, and suitable outdoor exercise. If sterility is the principal indication to be met, the simple measures described in the treatment of sterility (Chapter XXXIII) should be tried before anything more definite is undertaken. Non-operative local treatment, for the purpose of developing the pelvic organs, has been advocated by some; this is practically limited to the application of an aseptic intra-uterine electrode several times a week. In unmarried women this practice is to be condemned, but in the married the method may be tried although it is of doubtful value. After a thorough preliminary disinfection of the vagina and the cervix a sterile electrode is introduced into the uterus, and 10 to 12 milliamperemeters of the galvanic current are applied for ten minutes. This treatment may be repeated twice a week. The negative pole is placed in the uterus; the positive, on the abdominal wall.

As a rule, if general measures fail, the patient should receive immediate operative treatment. The classic operation for pathologic antelexion con-

sists in forcible dilatation of the cervix by means of the branched dilators of Goodell (Fig. 256) or the graduated sounds of Hegar. This operation must be performed under aseptic precautions, and as much dilatation as possible should be maintained for at least fifteen minutes, so that altogether about thirty minutes are consumed in the operation.

Another plan to overcome the acute angle formed by the cervical canal is the method proposed by Dudley, which consists essentially of splitting the posterior lip of the cervix from the angle of flexion to the vaginal vault (Fig. 257). Pozzi has recently introduced a plan of operation by which a bilateral laceration of the cervix is made, thus imitating the effect of labor in removing an obstruction of the cervical canal (Fig. 258). The most satisfac-



FIGS. 259-260.—Norris drain in position (as here drawn the bulbous extremity of the stem reaches too far above the internal os).

tory method for overcoming the acute angle of flexion and securing permanent enlargement of the cervical canal is the combination of thorough instrumental dilatation of the cervix and the insertion of a cervical stem, which is left *in situ* in the cervical canal for varying lengths of time. The form of stem that is most satisfactory is that devised by C. C. Norris (Figs. 259 and 260). This is made of hard rubber and in three sizes. The drains should be sterilized by boiling for fifteen minutes. After the cervix has been fully dilated the length of the uterine cavity should be determined, and care exercised in selecting the size that is suited to the case; when the drain is *in situ*, the bulbous extremity should reach well above the internal os and the flanges at the butt should be closely approximated to the vaginal cervix. The drain is made flexible by immersion in boiling water and bent slightly forward; after fixing the shape in cold water, the drain is introduced. Ex-

perience has shown that the uterus will expel the drain unless it is fixed in position, and this should always be done by attaching the flange on either side of the butt to the cervix by means of a silkworm-gut suture. The drain may be allowed to remain *in situ* over two or three menstrual periods. It can easily be removed by snipping the silkworm-gut sutures.

The introduction of the uterine stem must be preceded by the most careful examination under anæsthesia and the most rigid aseptic precautions. If there is any indication of adnexal involvement, or if evidences of inflammatory disturbances in the uterus or pelvis are present, the use of the uterine stem is absolutely contraindicated. Three days after the operation the patient may be allowed to get up, but douches and tub- and sitz-baths must be prohibited for a month. After the stem has been in position for a time the danger of infection of the uterine cavity from douche or bath water is lessened, but as long as the drain is in place it is well to avoid the douche and to limit bathing to the hot or cold shower or sponge baths.

Another method of securing effectual dilatation of the cervix is by means of an instrument known as the metranoikter. This apparatus is inserted with the patient under anæsthesia; after dilatation of the cervix the blades are released, and the instrument is left in place for twenty-four hours. This method gives rise to considerable pain, which must be controlled by opiates, but good results have been reported from its use.

RETROVERSION AND RETROFLEXION OF THE UTERUS

Pathology.—Retroversion and retroflexion of the uterus are usually combined (Figs. 250 and 251). The degree of version and the degree of flexion vary considerably. There are three degrees of retroversion; in the first, the axis of the uterus points toward the promontory of the sacrum; in the second, toward the hollow of the sacrum, and in the third, toward the sacrococcygeal articulation. The amount of backward flexion is usually proportionate to the degree of version; in some cases the angle between the cervix and the fundus is obtuse, whereas in others it is acute. In exceptional cases an anteфлекted uterus may be retroverted and in descensus.

The most common cause of retroversio-flexion is childbirth. After labor, when the uterus is heavy and the ligaments are lax and overstretched, the uterus may fall into a posterior position, due to the fact that involution of the organ itself or of its ligaments is interrupted (subinvolution), that the dorsal position is maintained too long, that the binder is too tight, or that there is too early resumption of activity on the part of the woman, which brings increased intra-abdominal pressure to bear upon the uterus and forces it down into the pelvis. These causes are often coincident. In such cases the uterus is enlarged and softened, and the ligaments are stretched and elongated both anteriorly and posteriorly. The same conditions may obtain after abortion, miscarriage, or premature labor. Retroversio-flexion may be produced gradually after labor, as the result of the loss of support to the pelvic structures normally afforded by the perineal floor. The mechanics of displacement from this cause are fully dealt with elsewhere

(page 264). Chronic constipation, with habitual distention of the sigmoid flexure, may exert a causative influence in certain cases of retroversio-flexion.

Retroversio-flexion may also be congenital, in which case it is usually accompanied by shortening of the anterior vaginal wall, poorly developed round ligaments, and other developmental defects. In exceptional cases retroversio-flexion may be acquired as the result of heavy lifting or of unusual exertion, which suddenly increases the intra-abdominal pressure. The sudden displacement that occurs in these cases may be accompanied by acute pelvic distress and other manifestations that subside in the course of a few days without the uterus being restored to its normal position. If these forces are brought to bear at a time when the bladder is fully distended with urine, they are especially prone to cause displacement. Under such conditions the intra-abdominal pressure may be exerted on the anterior instead of on the posterior wall of the uterus, in such a way as to drive the organ backward (Figs. 251 and 252). Falls or blows are said to be the cause of certain cases of retroflexio-version. While this is possible, its occurrence must be very rare. In aged multiparæ the uterus is often retroflexed and ptosed, due probably to atrophy of the fundus and of the ligaments of the uterus. There is often an associated relaxation of the pelvic floor. Moderate degrees of uterine displacement taking place in active reproductive life may become exaggerated about the time of the menopause, owing to an atrophy of the ligaments of the uterus and of the muscles of the pelvic floor. Many of the patients who at the menopause develop symptoms of pelvic floor relaxation and its sequelæ—cystocele, rectocele, and prolapse—never manifest subjective symptoms of these disorders previous to that time. The pregnant uterus may turn backward into retroversio-flexion or pregnancy may occur in an already retroversio-flexed organ.

The size of the uterus varies. In puerperal cases it is large at first, but after the condition has persisted for some time, the uterus may undergo a certain amount of shrinkage. In displacements that occur slowly following the puerperium and that are due to a lack of support of the pelvic diaphragm, no decided enlargement may be present. In traumatic cases and in nulliparous women the uterus may not be larger than normal. In congenital retroflexion the organ is often undeveloped, and in addition to the posterior flexion, the fundus may be flexed to one side. Retroversio-flexion is often accompanied by a certain amount of torsion, so that the body of the uterus is rotated on its long axis to the right or the left. In retroflexio-version the adnexa are invariably, and, as a matter of course, lower in the pelvis than normal. Usually they occupy a lateral position, but in some cases one or both of the ovaries may lie low down in Douglas' pouch, slightly to one side of the median line, in close relation to the fundus. The pregnant retroversio-flexed uterus, if uncorrected, either slowly rights itself and rises out of the pelvis, or becomes incarcerated beneath the sacral promontory and is finally emptied by abortion.

In persistent retroversio-flexion the pressure of the uterus upon the rectum and upon the ovaries and tubes may result in the formation of adhesions between these structures. At times an acquired displacement is coincident with inflammation of the adnexa following septic labor, or it may even be

secondary to such conditions, the displacement being due to the traction of adhesions between the fundus of the uterus and the peritoneal surfaces of Douglas' pouch.

Other factors concerned in displacement of the uterus will be considered more fully when dealing with descensus or prolapsus, since retroversio-flexion is usually the first stage of both.

Symptoms.—The symptoms of retroflexion consist of backache, a sense of weight in the pelvis, pressure about the rectum, painful and prolonged

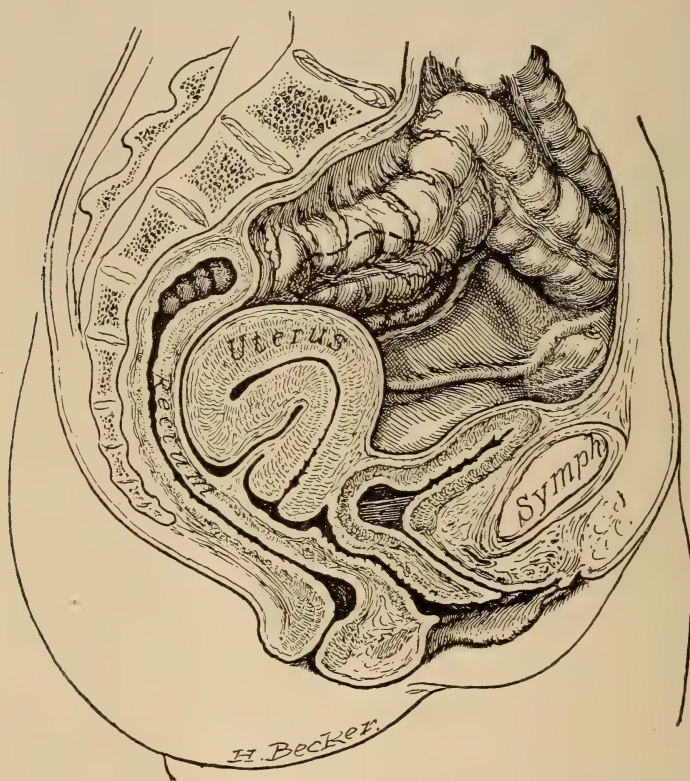


FIG. 261.—Sagittal section, showing uterus in extreme retroflexion, causing pressure on the rectum and traction on the bladder: constipation and vesical irritability.

menstrual periods, and leucorrhœa (Fig. 261). In exceptional cases retroflexion has been the only lesion present to account for headache and various reflex symptoms, such as nausea and vomiting. Bladder symptoms, such as frequent or painful micturition, may occur, and constipation is often marked, the patient complaining of a sensation as though an obstruction to fecal evacuation existed. Retroversio-flexion may, when the angle of flexion is acute, prevent conception. It is also a frequent cause of miscarriage.

Leucorrhœa usually depends upon hypertrophy of the uterine mucosa with hypersecretion, brought about by congestion of the pelvic blood-vessels and possibly as the result of some obstruction to free drainage if the

angle of flexion is acute. Menorrhagia may be a prominent symptom, especially if hypertrophy of the endometrium and subinvolution are present. The woman may complain of pain in the lower abdomen, on one or both sides, and this is especially marked if, associated with the retroflexion, there are adhesions that bind the uterus and the adnexa together or if one or both of the ovaries lie in Douglas' pouch. If but one ovary is prolapsed, the pain may be especially marked on that side. Under these circumstances dyspareunia may be present.

Dysmenorrhœa usually persists throughout the menstrual period, the pain being due to the marked congestion of the uterus occurring at this time; gradually becoming less severe as the period subsides, occasionally persisting for a few days after the flow has ceased. If the angle of retroflexion is acute, the menstrual pain may be of the obstructive type, *i.e.*, most severe shortly before the appearance of the flow. The majority of the symptoms are relieved when the patient is quiet and at rest, and most of them are exaggerated by the erect position, walking, or working. Vesical symptoms, abdominal distress, and backache may be relieved by rest in the recumbent posture.

Diagnosis.—Simple digital examination discloses the fact that the cervix is well forward in the vagina, and nearer than normal to the vaginal orifice. If the finger is pressed upward in front of the cervix, the uterine body cannot be felt; if it is carried back of the cervix, a rounded body (the fundus) can be outlined, and between it and the cervix an angle of flexion can be made out (Fig. 121). Bimanual examination confirms and amplifies these findings. The fundus cannot be palpated between the vaginal finger pressed upward on the anterior wall in front of the cervix and the abdominal fingers dipped down above the symphysis. If the vaginal finger is passed posteriorly and pressed against the fundus, and the abdominal hand is dipped downward deep into the pelvis, just below the sacral promontory, the body of the uterus may be grasped between them (Fig. 125).

The examination of a case of retroflexio-version of the uterus is not complete until it is ascertained whether the position of the organ is fixed, *i.e.*, whether or not the uterus is adherent. An effort should at once be made to replace the organ (*vide infra*). This should be done with the utmost gentleness, especially in those cases in which the adnexa appear to be enlarged or fixed.

There are some pelvic disorders that may simulate a retroversio-flexion of the uterus. Thus a fibroid springing from the posterior uterine wall, a hæmatocele, a small ovarian cyst, or, indeed, any rounded adnexal tumor occupying the bottom of Douglas' pouch must be differentiated. The vaginal finger alone may be unable to detect the difference between them, but upon making bimanual palpation the body of the uterus can be outlined in front of the mass lying in Douglas' pouch and bulging the posterior vaginal fornix (Fig. 126). In certain obscure cases the passage of a sound may be required to settle the question.

Treatment.—For the individual case of retroflexion of the uterus the treatment to be selected depends upon the condition of the pelvic floor, the

mobility of the uterus, and the state of the adnexa. If the pelvic floor is sound, a pessary may be introduced to support the uterus, provided the latter can be replaced and maintained in a normal position and no abnormalities of the adnexa are present. Even if a certain degree of relaxation of the pelvic floor exists, there may be enough support to retain a properly selected Smith pessary in correct position. If the pelvic floor is so greatly relaxed that a pessary cannot be kept in place; if there are adhesions that prevent replacement of the uterus, or if the adnexa are diseased, operative treatment alone can be considered. During the active reproductive period a pessary should, if possible, be used. (See Selection and Preparation of Cases for Operation, Chapter XXXV.)

The degree of support afforded by the perineum and the existence of adnexal tumors can be quickly and easily ascertained by the usual methods of examination. Whether or not the uterus or the adnexa are adherent is

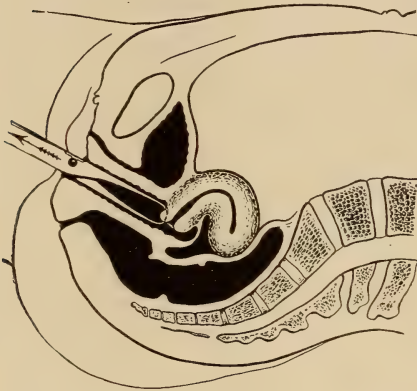


FIG. 262.—Replacement of retroflexio-version of the uterus. The cervix is grasped with a tenaculum.



FIG. 263.—Replacement of retroflexio-version of uterus. The uterus is straightened out and the angle of flexion diminished by traction on the tenaculum.

usually determined by the success or failure of the **method used to replace the uterus**. In simple cases, when the abdominal wall is neither fat nor rigid and the patient is not excessively tender, the uterus may be replaced by pushing up the fundus through the posterior vaginal vault, then pressing the cervix backward by the fingers placed in contact with the anterior surface of the cervix, at the same time engaging the fundus with the abdominal hand and drawing it gently forward.

If the abdominal walls are fat or rigid; if the patient is hypersensitive or easily frightened; or if the uterus is large and heavy, this simple plan may fail, even though no adhesions are present. Under such circumstances the following method has usually been successful: The cervix is grasped with a double tenaculum and pulled down toward the vaginal orifice; this maneuver straightens out the angle of the retroflexion, and brings the fundus within easy reach of the forefinger introduced into the rectum.

Holding the cervix down, the fundus is now pressed upward by the rectal finger until the angle of posterior flexion is overcome, or the uterus

is anteфлекed. With the rectal finger in position the cervix is now pushed backward toward the hollow of the sacrum by the attached tenaculum, and an attempt is made by the abdominal hand to engage the posterior surface of the uterus through the abdominal wall. The tenaculum is now removed from the cervix, but the posterior position is maintained by pressing back-

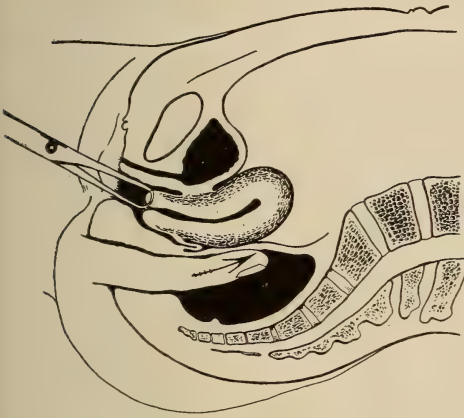


FIG. 264.—Replacement of retroflexio-version of uterus. The index finger in the rectum pushes the fundus upward, entirely correcting the retroflexion, anteфлекing the uterus and beginning anteversion.

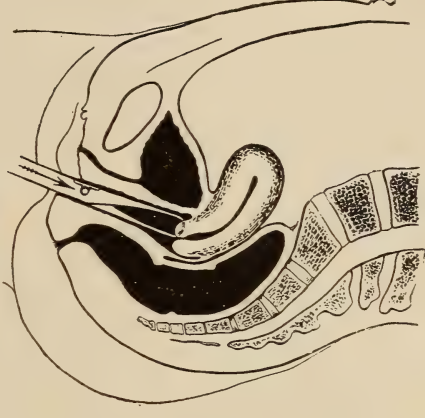


FIG. 265.—Replacement of retroflexio-version of uterus. The cervix is now pushed back into the hollow of the sacrum as far as it will go.

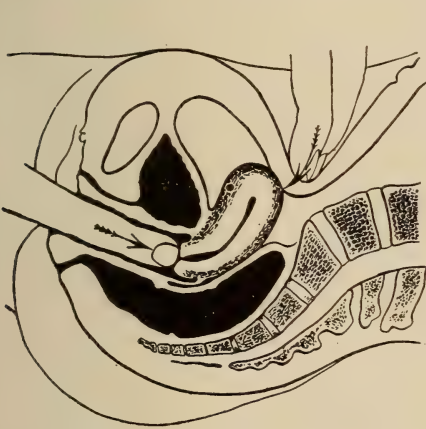


FIG. 266.—Replacement of retroflexio-version of uterus. The tenaculum has been removed. The index finger of the vaginal hand continues pressure backwards on the cervix; the fingers of the abdominal hand engage the fundus and pull it forward.

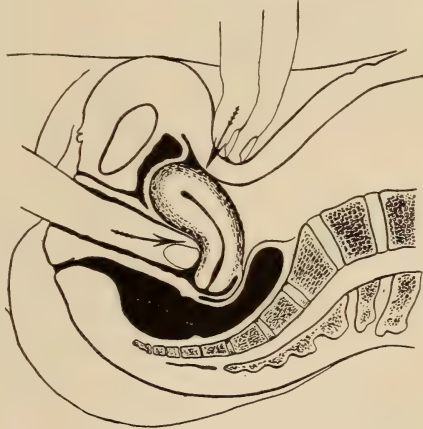


FIG. 267.—Replacement of retroflexio version of uterus. By further pressure on the cervix backwards and pull on the fundus forwards, the uterus is brought into slightly exaggerated anteversion and anteversion.

ward upon the cervix with the fingers of the left hand, while with the right hand the efforts to engage the posterior surface of the uterine body are continued, and the body is drawn gently upward and forward (Figs. 262 to 267).

Occasionally, in order to avoid the sacral promontory, it is advisable to push the fundus to one side or the other of the median line with the rectal finger. In some cases in which this procedure is not successful the failure

is due not to adhesions, but to the rigidity of the patient, or the thickness of the abdominal wall. In other cases there are slight adhesions that can be stretched by gradual replacement of the uterus with tampons. Consequently, if the effort at replacement fails, in spite of the fact that the history, associated symptoms, and absence of adnexal enlargement make adhesions or associated inflammatory conditions improbable, the gradual replacement method may be tried before operation is undertaken. This method consists of pushing the uterus bimanually to as nearly a normal position as possible, without using force or inflicting pain, and then placing the patient in the knee-chest position and packing the posterior vaginal vault with tampons in order to maintain, for a time, the gain that has been made in replacement (Fig. 268). The tampons are saturated with



FIG. 268.—The patient in the knee-chest position and the vaginal fornix packed with tampons.

a 25 per cent. solution of glycerite of boroglyceride. This solution exerts a hygroscopic effect on and has a tendency to deplete the uterine vessels and to reduce the size of the uterus. In this way, usually after three or four treatments, or in the most stubborn cases after seven or eight, the uterus may be fully replaced without tension to its normal position, and a pessary can then be inserted.

Much depends on the fitting of a pessary; if properly fitted, it will do its work well and the patient will be comfortable, whereas under the opposite conditions it may fail utterly. Even though the uterus can easily be replaced, at the first examination it is a good plan to use tampons several times before employing the pessary. This preparatory treatment im-

proves the condition of the mucous membrane and accustoms the patient to the presence of a foreign body in the vagina.

The most suitable form of pessary for the treatment of retroversion is the Smith. This pessary is furnished in five sizes. The most important measurement to ascertain before selecting the pessary for the individual case is the distance between the posterior vaginal fornix and a point on the anterior vaginal wall a half inch within the external urinary meatus. This distance may be estimated by the first finger, or, if preferred, by means of a pair of dressing forceps and a cotton pledget. The width of the pessary, which is greatest at the upper curvature, is proportionate to the length, so that if the pessary is of the proper length, its width will be satisfactory. The desirable width may be determined, if necessary, by separating the blades of a pair of dressing forceps in the vaginal fornices, so that the blades impinge upon the lateral vaginal walls; the amount of separation between the handles is then measured. After withdrawing the forceps the separation may be restored and the desired information obtained.

After selecting the size that appears to be suitable, the pessary is introduced in the oblique axis of the vagina (Figs. 269 and 270), the upper part being inserted as far as the cervix. With the forefinger the upper bar is then depressed beneath the cervix, so that the vaginal cervix lies within the greater curve. If the pessary is of proper size, the lower bar will be in contact with the anterior vaginal wall at a point where elevation allows it to

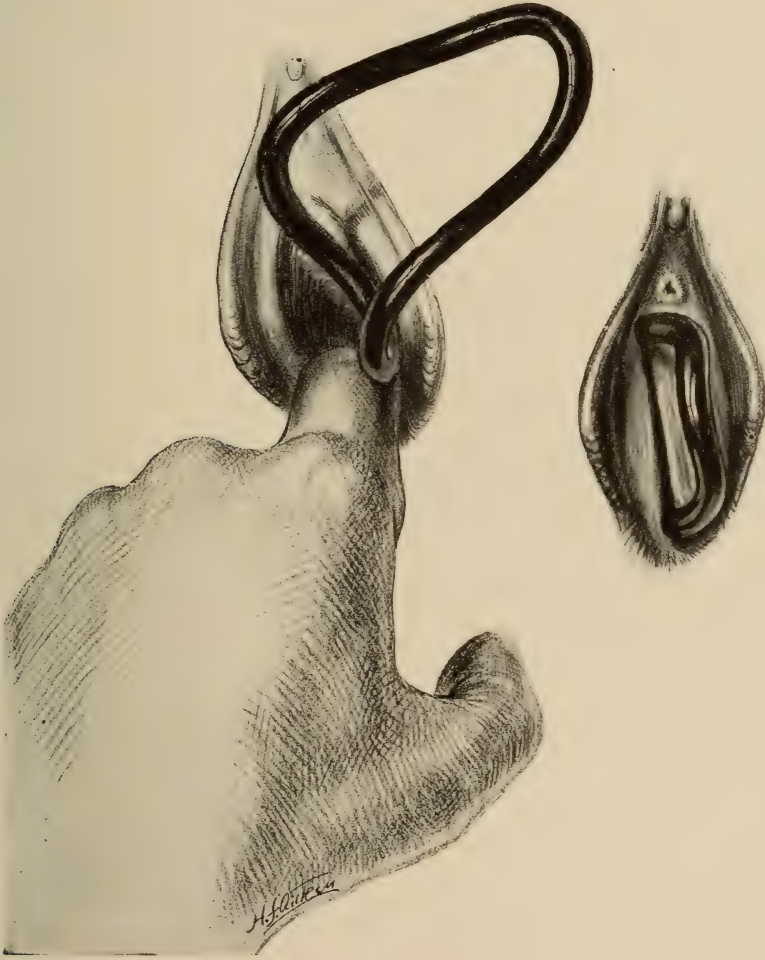


FIG. 269—Introducing a pessary. The patient in the dorsal position; the sulcus on one side is retracted with the first finger. The pessary is introduced in the oblique diameter.

ride easily back of the symphysis without pinching the urethral tissues between it and the pelvic arch. Furthermore, it should be possible to pass the finger without difficulty between the lateral bars of the pessary and the vaginal walls, and the vaginal vault should be comfortably spanned, but not stretched. If the vaginal vault is put on a tension, if the patient complains of pain when the finger is passed between the pessary and the vaginal wall,

or if, on pressing the anterior bar upward, the pessary does not ride easily behind the symphysis, then a smaller size must be selected. If, on the contrary, the pessary is so small that it lies loosely in the vagina or does not fit the vaginal vault snugly and ride up well back of the cervix, or if, upon straining, there is a tendency for the pessary to come out, a larger size should be selected.

When the vault of the vagina is low, a modification of this form of pessary, known as the Emmet, may be found more suitable than the Smith, and occasionally, if there is some relaxation of the vaginal outlet, the Hodge pessary, which has a broader lower bar, may be found more effective.

In extreme cases of retroflexion, when the vaginal vault is very roomy and the pelvic floor is relaxed, a ring pessary may be the only form that can be used. Such cases are more properly classed under the head of descensus or prolapsus uteri, and the plan to be adopted will be considered in connection with the treatment of these lesions.

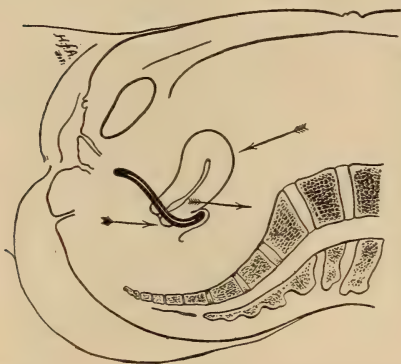


FIG. 270.—Schematic diagram illustrating mechanics of pessary. The posterior vaginal wall stretched over the upper transverse bar of the pessary pulls the cervix upward and backward, thus throwing the fundus forward. The pessary imitates the action of the uterosacral ligaments.

After the pessary has been introduced it may be advisable in some cases to place the patient in the knee-chest position and to retract the posterior vaginal wall; this is done for a double purpose—first, for inspecting the vaginal vault to see that the upper bar of the pessary is in its proper place, and secondly, to allow the intestines to gravitate out of the pelvis so that, upon resuming the erect or recumbent position, there will be no knuckle of gut between the anterior surface of the uterus and the bladder to favor a recurrence of the displacement.

Before a pessary is introduced *one must always be sure that the uterus is in good position.* The pessary does not act by pressing on the uterus itself, but by stretching the posterior vaginal vault and the uterosacral ligaments over its upper bar. This pulls back on the cervix and throws the fundus forward. In cases in which there has been prolapse of the ovary, care must be exercised in introducing the pessary; in such cases, following the introduction of the pessary, the patient should be directed to assume the knee-chest position daily in order to prevent incarceration of the ovary in Douglas' pouch.

After the patient has been properly fitted with a pessary, she should be directed to return at the end of twenty-four to forty-eight hours, when an examination should be made so as to determine positively that the uterus is held in good position, and that there is no undue tension of, or pressure upon, the vaginal walls. After that she may be directed to return at the end of a month, and should be told that if, in the meantime, she experiences pain or discomfort, or if an unusual discharge appears, to consult a physician immediately, or, if this is impossible, to remove the pessary herself. As a rule, douches are unnecessary and contraindicated while the pessary is

worn. If an occasional douche is needed for purposes of cleanliness, sterile water or a very weak solution of lysol (1:200) may be used.

At the end of a month or six weeks the pessary should be removed for twenty-four hours, when, if the displacement has recurred, the uterus should be returned to its proper position and the pessary reinserted. This plan should be repeated every month or six weeks. In recent cases, following



FIG. 271.—Alexander's operation. (Kelly and Noble, Gynecology and Abdominal Surgery. W. B. Saunders Co.)

labor or miscarriage, the uterus will, as a rule, remain in place at the end of three or four months. In some cases a longer time is required for the ligaments to undergo involution and hold the uterus securely. If a cure is not accomplished at the end of six months, the patient may choose between wearing the pessary indefinitely or submitting to an operation. (See Selection of Cases for Operation, Chapter XXXV.)

The treatment of a pregnant retroversio-flexed uterus consists of re-

placement and the introduction of a pessary. If the case is seen early and there is no immediate danger of incarceration, the assumption of the knee-chest position twice daily may be sufficient. The uterus may gradually right itself, after which a pessary should be introduced. If this plan fails, or if incarceration is imminent, an attempt should be made to replace the uterus at one sitting by the usual methods, except that the cervix should not be caught with a tenaculum. It may be necessary to use general anæsthesia before success can be achieved.

The **operative treatment** of retroversio-flexion of the uterus consists of shortening some of the ligaments of the uterus or attaching them or the uterus itself by sutures directly to a neighboring organ or to the abdominal

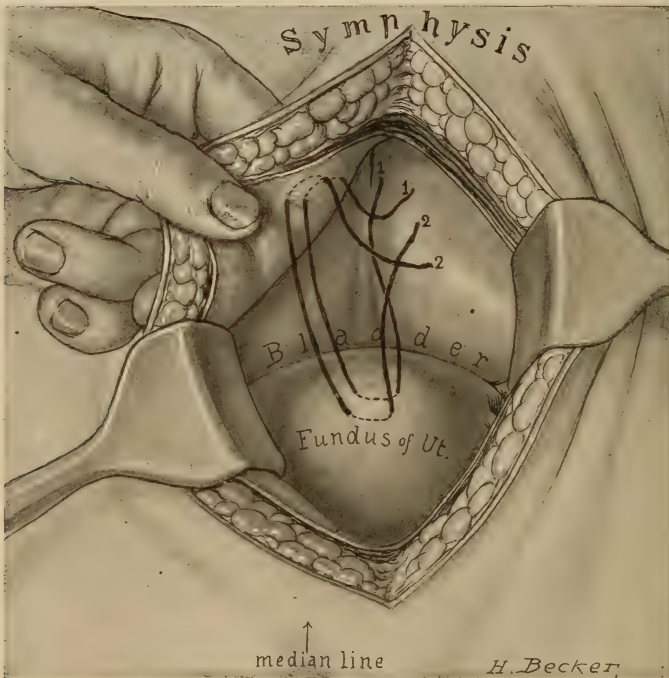


FIG. 272.—Ventrosuspension. (Kelly and Noble, *Gynecology and Abdominal Surgery*. W. B. Saunders Co.)

parietes. One of the earliest methods of treatment, and one that is still applicable in young women or in uncomplicated cases of retroversio-flexion in women of all classes, is shortening of the round ligaments as they lie within the inguinal canal. This is commonly known as Alexander's operation (Fig. 271). The scope of this operation is limited, since in young women surgical measures for the correction of retroflexion are not frequently employed; moreover, when operative treatment of this condition is required, the retroversio-flexion is often accompanied by some intra-abdominal condition that needs correction; or the patient may declare that if she is to undergo an operation, the appendix should be removed at the same time.

One of the chief advantages of the Alexander operation, when it was

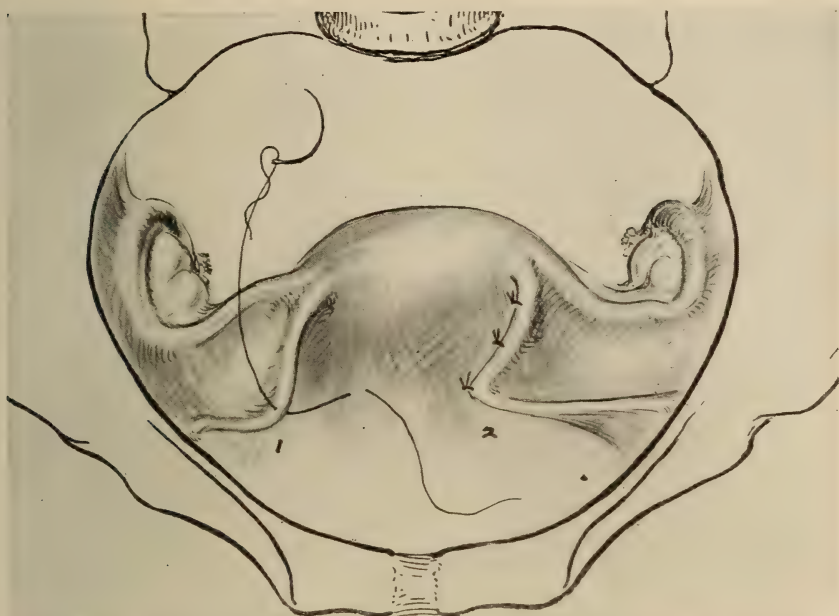


FIG. 273.—Coffey's operation. Steps 1 and 2.

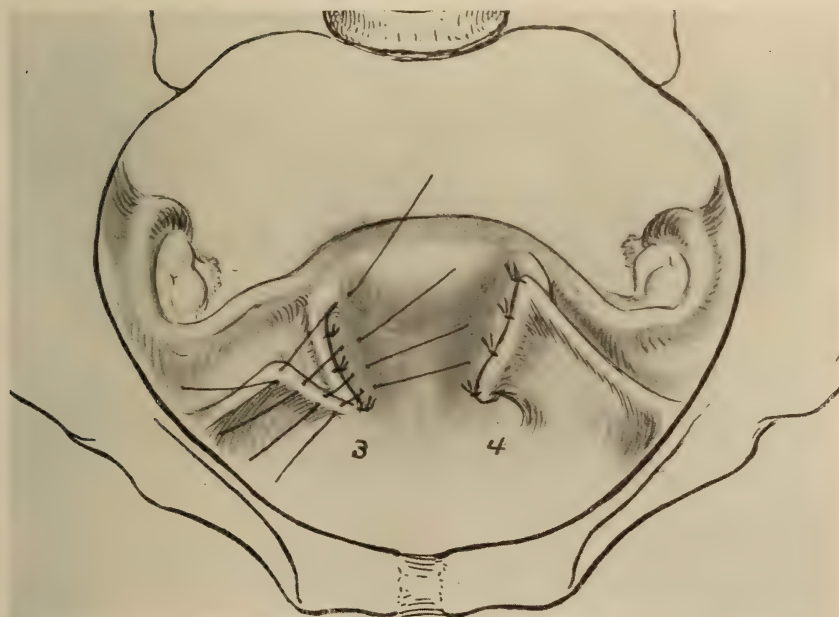


FIG. 274.—Coffey's operation. Steps 3 and 4. After step 4 the peritoneum of the anterior leaflets of the broad ligament is drawn over the suture line of the round ligament and attached to the uterus by a continuous suture.

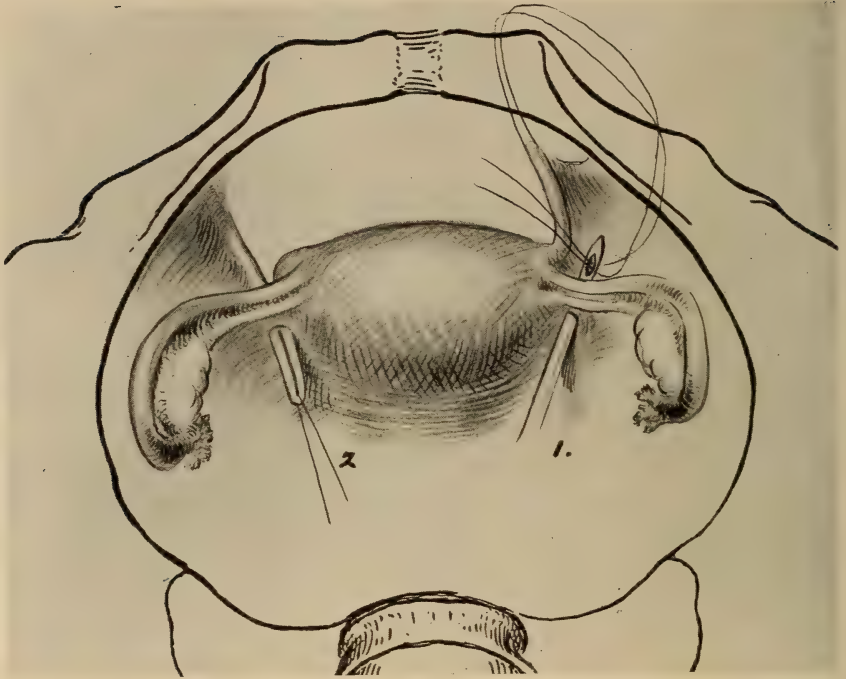


FIG. 275.—Webster-Baldy operation. Steps 1 and 2.

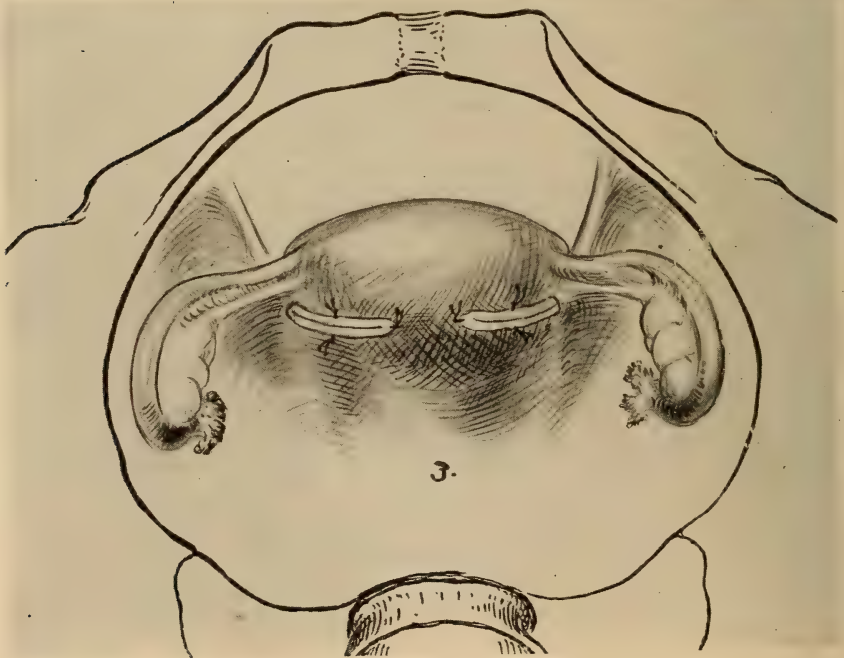


FIG. 276.—Webster-Baldy operation. Step 3.

first employed, was due to the fact that the peritoneal cavity was either not at all or only very little invaded. At the present time, with the perfection of aseptic detail, there is but little risk from a peritoneal opening, and if the patient objects to the scar of a median incision, the skin may be incised transversely just above the symphysis.

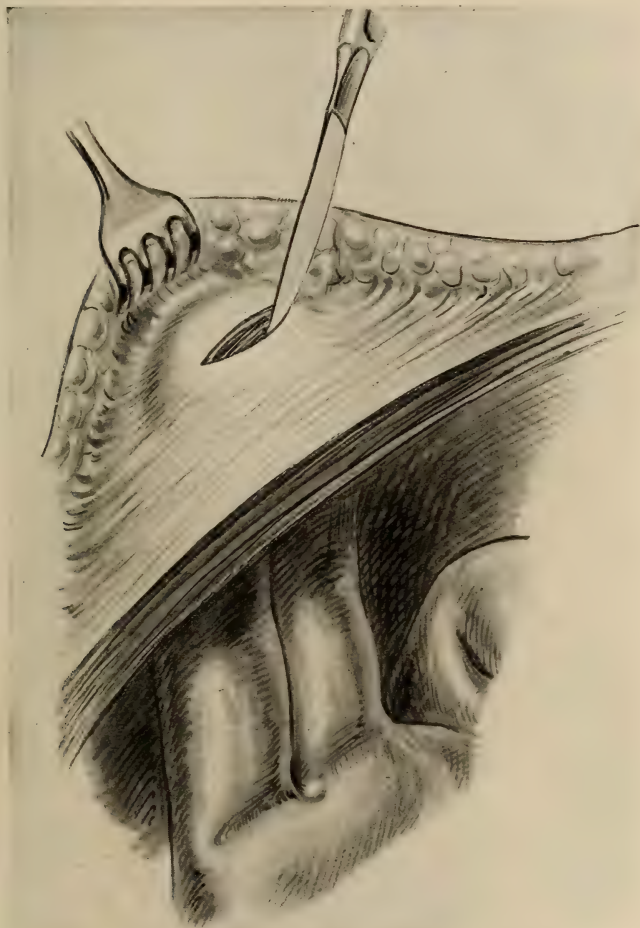


FIG. 277.-Simpson operation. The skin and fat are retracted and freed from the fascia of the rectus muscles on both sides of the lower extremity of the abdominal incision slightly below the level of the internal ring. The fascia is incised for half an inch about one inch from the median border of the fascia on each side, the fingers inside the incision giving support.

The intraperitoneal operations for the cure of retroflexion are numerous. A number of years ago ventrosuspension of the uterus, or the attachment of the fundus to the anterior abdominal wall, was the method usually adopted, and when the operation was correctly performed, the immediate results were excellent (Fig. 272). The opportunities for later sequelæ of a serious nature are numerous enough to abandon this form of uterine suspension during the reproductive period.

The unfortunate and grave sequelæ of ventrosuspension were the consequence of a too firm attachment of the uterus to the abdominal parietes. This was due to the fact that the operator included the fascia of the abdominal wall in his suture, or, as the result of suppuration of the incision or from a peritonitis, the attachment became permanent and extensive. The ideal result of ventrosuspension properly performed is the production of a new ligament running from the fundus of the uterus to the anterior abdominal wall, and made up largely of peritoneal and subperitoneal cellular tissue, and a few muscle-fibers that have been gradually pulled away from the peritoneal surface of the anterior abdominal wall, to which the uterus was attached. It can readily be seen how this band may, to a certain extent, be a menace to the intestines, and in some cases intestinal obstruction has occurred.

Many forms of operation for the shortening of the round ligaments have been suggested. The original Mann operation consisted simply in reduplicating the ligaments upon themselves and suturing the reduplications together. The three forms of round ligament operations that seem best adapted to the majority of cases are: First, the plan elaborated by Coffey (Figs. 273 and 274), which consists of reduplicating and attaching the round ligaments to the anterior surface of the uterus; secondly, the type of operation devised by Simpson and used with great satisfaction by many surgeons, which consists of attaching the round ligaments to the abdominal

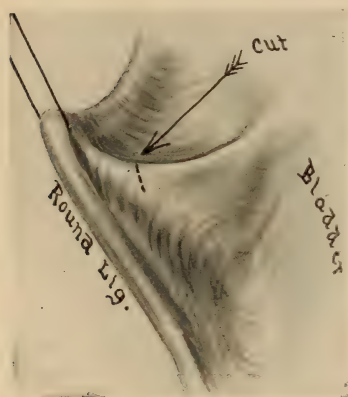


FIG. 278.—Simpson operation. The ligament is pulled up and a small snip made in the peritoneum of the anterior surface of the broad ligament directly beneath the traction suture.

parietes; each ligament in turn is caught and pulled through a slit in the peritoneum close to the internal ring, and then guided between the peritoneum and the anterior abdominal wall to the rectus muscle; the fascia of the rectus muscle is perforated, and the ligament is drawn through and attached by means of sutures (Figs. 277–280); thirdly, the method suggested by Webster and Baldy, of drawing the round ligaments through the broad ligament to the posterior surface of the uterus and attaching them at this point (Figs. 275 and 276), an operation that is particularly suited to those cases in which the ovaries are especially low.

The real test of all types of operation for correcting retroflexion of the uterus is the effect the operation has on pregnancy and labor, and whether the displacement is likely to recur during the puerperium. Fixation of the uterus may prevent the physiologic enlargement incident to pregnancy, and lead to abortion or overstretching and thinning of certain parts of the uterus. Fixation of the uterus has resulted in grave dystocia, requiring craniotomy or Cæsarean section, or serious forceps operations. During the child-bearing period the uterus should never be fixed, but always suspended. When, however, the patient has passed the child-bearing age, it is advisable

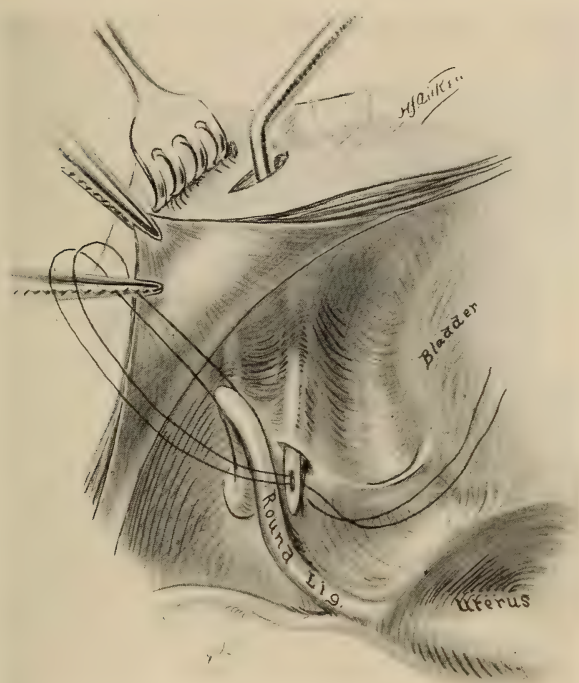


FIG. 279.—Simpson operation. A specially curved needle is now passed through the fascial cut, between the muscle bundles to the peritoneum, beneath this to the internal ring, then under the peritoneum of the anterior leaflet of the broad ligament and through the peritoneal cut. The traction suture ends are then threaded through the eye of the needle, which is withdrawn.

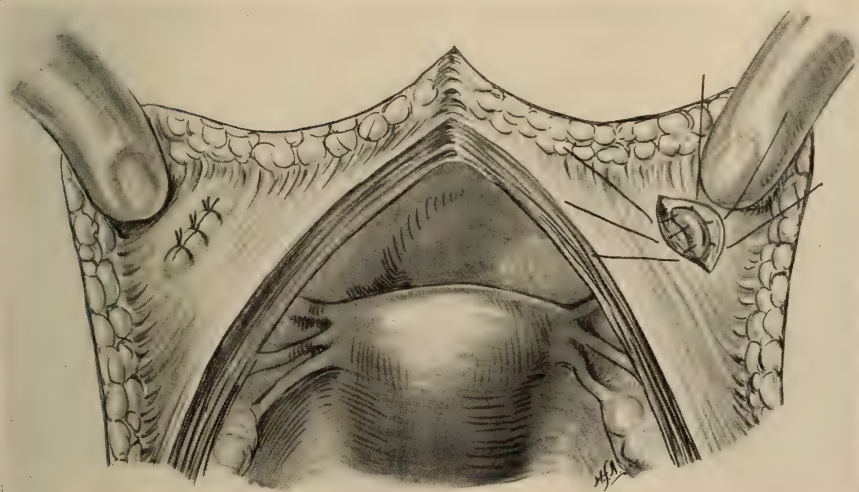


FIG. 280.—Simpson operation. The round ligaments are sutured to the under surface of the fascia by three interrupted sutures of fine linen or catgut. These also close the fascial incision.

to furnish permanent support, and the uterus may then be fixed to the anterior abdominal wall. This is accomplished by attaching the fundus of the uterus to the fascia of the abdominal wall (Figs. 287 and 288), in the manner to be described later, under the Treatment of Descensus and Prolapse, page 268.

The uterus may also be suspended or fixed through a vaginal incision that invades the abdominal cavity through the uterovesical peritoneum. This plan is regarded as eminently satisfactory by those gynecologists who have had much experience with it, but its scope is limited, since the tubes and ovaries are not so well exposed to surgical treatment, and lesions of the vermiform appendix or other intra-abdominal affections that need correction cannot be treated.

Alexander's Operation.—The technic detailed by Noble should be followed. An incision about two and one-half inches in length is made from the spine of the pubes, a little above but parallel with a line between the spine of the pubes and the anterior superior spine of the ilium. The incision is carried through the skin, subcutaneous fat, and superficial fascia down to the external oblique. Each bleeding point is caught and ligated—this is a cardinal point in the successful performance of the operation, for if it is neglected the tissues become blood-stained and identification of the round ligament is rendered difficult. When the external oblique is exposed, the superimposed fat is detached throughout the length of the incision, and on each side of its median line for about 1 cm. The external ring is now located either by sight or by touch, and the external oblique muscle is divided in the direction of its fibers about as far as the internal ring. The borders of the divided external oblique are now retracted, and the internal oblique muscle is separated from Poupart's ligament by blunt dissection. This completely exposes the inguinal canal. The round ligament and the ilio-inguinal nerve are identified, and the nerve is drawn to one side. When the ligament is seen, it should be caught with a blunt hook and drawn out until the reflection of the peritoneum is seen. As the ligament is drawn out the reflection of the peritoneum is detached by means of blunt dissection. The amount of shortening can be determined by palpating the lower surface of the abdominal wall just above the pubes; with experience the operator will be able to estimate this correctly by muscular sense. The peritoneum is opened in from 30 to 50 per cent. of the cases; when this occurs the adnexa may be palpated through the opening. After the ligaments have been sufficiently shortened, the excess is cut away and the ligament is stitched to the fibers of the internal oblique and Poupart's ligament, the external oblique fascia being united over them as in the Bassini operation for the radical cure of inguinal hernia (Fig. 271). If the peritoneum is opened, it should, of course, be sutured with fine catgut. If there is difficulty in locating the round ligament, the best guide is the internal ring. The operation is applicable only when disease of the adnexa and adhesions can positively be excluded. Its field of application is, therefore, quite limited.

Ventrosuspension.—A low paramedian cœliotomy incision is made to the right of the median line. The lower end of the incision should reach the symphysis pubis. The peritoneum to the left of the incision in the lower angle of the wound is caught with artery forceps and pulled out of the

incision and to the right. A needle armed with celloidin thread is now passed through the exposed peritoneum at the extreme lower end of the incision, the point of entrance being two centimeters from the edge of the peritoneum. In its sweep the needle embraces the adjacent preperitoneal connective tissue and a few fibers of the rectus muscle and emerges about a centimeter to the left of its point of entrance. The needle is then passed through the fundus of the uterus, slightly posterior to a line between the uterine insertion of the tubes, picking up tissue one centimeter in depth and breadth. A second suture is passed in exactly the same manner as the first, but a centimeter above it (Fig. 272). After both sutures have been placed they are tied with care, a finger in the abdominal cavity preventing the coils of intestine from slipping between the fundus and the inner surface of the abdominal wall.

In this operation none of the fixed constituents of the abdominal wall are included in the suspension suture, so that subsequent to the operation a gradual separation between the fundus of the uterus and the anterior abdominal wall takes place, and a new ligament is formed by traction from the parietal peritoneum and the few fibers of the rectus muscle embraced by the sutures. The technic described is similar to that employed in the method of McMonagle. It fixes the fundus directly in the median line, but places the point of attachment a couple of centimeters away from the line of peritoneal closure, so that in the event of suppuration of the incision—which very rarely occurs—the inflammatory process does not reach the suspension sutures.

Ventral Fixation.—The object of ventral fixation is totally different from that of ventrosuspension. By ventral fixation the fundus of the uterus is permanently attached to the fixed structures of the anterior abdominal wall. This operation is never justifiable unless future conception is impossible. It consists in making a low median *cœliotomy* incision, pulling the uterus upward into the lower angle of the incision, and attaching the peritoneum to the periphery of the fundus, thus making it extraperitoneal. The rectus muscle on either side of the incision is now separated from the under surface of the fascia and the fundus is attached directly to the fascia by two or more sutures of No. 1 forty-day chromic catgut (Figs. 287 and 288).

Coffey's Operation.—Coffey has devised an operation (Figs. 273 and 274) in which he utilizes the round ligament and a portion of the broad ligament. In performing this operation a low median *cœliotomy* incision is made. A point on the round ligament is selected the approximation of which to the uterine cornu, the uterus being held in proper position, makes the ligament between the internal ring and the point of approximation taut. The apex of the loop thus formed is then attached to the anterior surface of the uterus, about an inch below the insertion of the round ligament. At the point originally selected the ligament is then drawn over to the cornu of the uterus, and attached immediately below the insertion of the round ligament. The peritoneum of the broad ligaments between these two fixed points is united to the peritoneum of the anterior uterine wall by a running catgut suture. The same plan is carried out upon the opposite side.

Simpson Operation.—This is performed as follows: A low median

cœliotomy incision is made. A point on the round ligament is selected the approximation of which to the anterior abdominal wall holds the fundus of the uterus in good position. The round ligament at this point is surrounded by a strand of catgut (traction loop). Sufficient traction is made upon the loop to expose the anterior face of the broad ligament, the peritoneum of which is snipped just below the point of traction. The lower outer surface of the rectus fascia is bared for an inch to one side of the incision. A longitudinal cut one centimeter in length is made through the fascia, two centimeters or slightly more from the edge of the fascia, on a level with the internal abdominal ring, exposing the rectus muscle (Fig. 277). A long and especially curved blunt pedicle needle is passed through the fascial opening and the fibers of the rectus until it is felt immediately beneath the peritoneum; it is then turned outward and made to traverse the extraperitoneal space between it and the abdominal wall and the anterior surface of the broad ligament, until it can be pushed through the opening made in the anterior leaflet of the latter, just below the point selected on the round ligament (Fig. 278). The ends of the catgut loop are passed through the eye of the needle and the needle is withdrawn. Traction on the catgut draws the round ligament under the peritoneum across the anterior face of the broad ligament to the internal ring, beneath the peritoneum of the anterior abdominal wall, to the outer border of the rectus muscle, through the muscle, and to the fascial incision. The loop of the round ligament presenting in the fascial incision is sutured to the under surface of the fascia with three interrupted sutures of linen thread. The sutures do not surround but perforate the ligament peripheral to the central artery. The sutures are so disposed as to close the fascial incision at the same time that they attach the ligament.

Webster-Baldy Operation.—Webster and Baldy have devised a plan of operation whereby the round ligament is drawn through the broad ligament below the utero-ovarian ligament, and attached to the posterior surface of the uterus (Figs. 275 and 276). This operation is of value principally in cases associated with marked prolapse of the ovary. A point on the round ligament of one side is selected which, when approximated to the cornu of the uterus, will make the round ligament taut from the internal ring to the uterine cornu. At the junction of the parallel limbs thus formed, a strand of catgut (traction loop) is passed around but not through the ligament. With the forefinger beneath the utero-ovarian ligament, a clear space in the ligament is now found, and the ligament perforated from behind forward with a curved blunt artery forceps. The points of the instrument are slightly separated, so as to stretch the opening, and the ends of the catgut strand are caught in the grasp of the forceps. The round ligament is now drawn through the opening in the broad ligament to the posterior surface of the uterus. The same procedure is carried out on the opposite side. The round ligament is sutured to the posterior uterine surface, about an inch below the fundus, with interrupted linen sutures. When the ligaments are greatly relaxed, the loops of the two round ligaments may be united in the median line, or in some cases they may even be

overlapped. Great care should be exercised to avoid puncturing the round ligament vessels; the openings in the broad ligaments should be large enough to obviate constriction of the round ligament. The ligaments should not be drawn tight. The linen sutures should not surround the ligaments, but should be made to perforate them to the peripheral side of the central artery. All these precautions have as their object the preservation of the circulation in the round ligament.

Shortening of the Uterosacral Ligaments.—Shortening of the uterosacral ligaments may be performed in conjunction with other operations of uterine suspension when the ligaments appear unduly relaxed, as is indicated by the fact that the cervix itself seems particularly low in the pelvis; in other words, when, in addition to retroversion or flexion, there is well-marked descensus. After the round ligament operation is completed and any necessary pelvic treatment has been carried out, the patient should be placed in an exaggerated Trendelenburg position, and the intestines well packed out of the pelvis. The fundus of the uterus is held forward with a long, narrow retractor. A mattress linen suture is passed on each side from the posterior surface of the uterus, below the position of the internal os, through the uterosacral ligament, about 2–3 cm. from the uterus. When tied, this suture will usually give the necessary amount of shortening of the ligament, but it must be adapted to the individual case. One or more additional mattress sutures are then passed to secure approximation of the reduplicated part of the ligament and the posterior surface of the uterus below the position of the internal os (Fig. 289).

DESCENSUS AND PROLAPSE OF THE UTERUS

Etiology, Pathology.—The terms descensus and prolapse of the uterus imply a descent or a dropping of the uterus below its normal level in the pelvis. Descensus frequently complicates retroversio-flexion of the uterus. Indeed, the first stage of descensus is, as a rule, preceded by a turning backward of the uterine axis (retroversion), and this is combined, as usual, with backward flexion (retroflexion). The causes of descensus are the same in kind as those that produce retroversio-flexion, but greater in degree. The incompetency of the uterine ligaments, the pelvic floor, and the abdominal wall is more marked than in retroversio-flexion.

The forces that normally hold the uterus at its proper level may well be illustrated by the two simple experiments in physics noted by Penrose. The abdominopelvic cavity may be compared to a glass cylinder filled with water, and closed above and below by the finger and thumb. Normally, the bottom of the abdominopelvic cavity is the pelvic floor, the top is the diaphragm, and the sides are made up of the anterior, posterior, and lateral abdominal and pelvic parietes (Fig. 281).

If the thumb is removed from the bottom of the glass tube, the water does not run out, but is held in the cylinder by atmospheric pressure and by virtue of the unyielding walls and the finger securely closing the top. Similarly in the abdominopelvic cavity (Fig. 282), when the perineal floor is injured, if the parietes of the abdomen retain their strength, the retentive

power of the abdomen tends to prevent a descensus of the pelvic and the abdominal viscera. If, however, the anterior abdominal parietes are relaxed and weak, instead of being strong and unyielding, a similar effect is exerted upon the pelvic viscera as if a section of the glass cylinder were replaced by rubber-dam which would yield to atmospheric pressure—some of the water would then be lost.

The influence of relaxation of the pelvic floor on the position of the uterus may also be illustrated in the following way: Given a vessel filled with water at rest, a molecule of water some distance from the bottom of the vessel is pressed upon equally in all directions—that is, the pressure beneath is equal to the weight of the column of water above. The pressure from

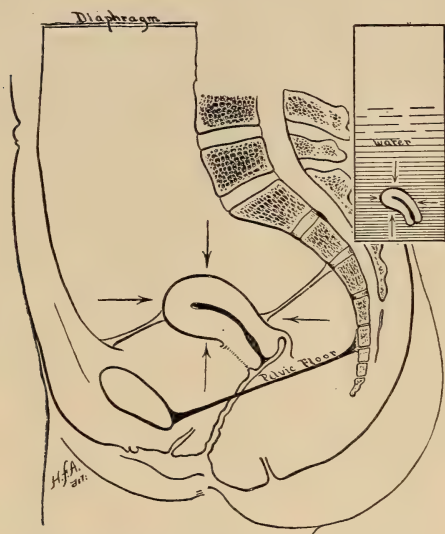


FIG. 281.—The pressure upon the uterus from all sides is equal; it has been compared to the equilibrium of a molecule of water in a vessel; the sides of the vessel are the pelvic and abdominal walls. The floor of the vessel is the pelvic floor. The uterine ligaments act simply as guy ropes.

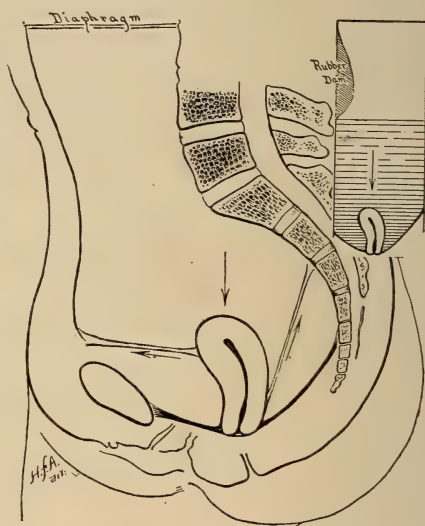


FIG. 282.—The pelvic floor is torn and the uterus is now a part of the floor of the pelvis; the intra-abdominal pressure on the uterus must be met by the ligamentous and other attachments of the uterus. The anterior abdominal wall is relaxed and the retentive power of the abdomen is impaired.

below is maintained partly by the strength of the bottom of the vessel. The latter may be represented by the pelvic floor, the intervening water by the vagina, the cellular tissue surrounding it, and the bases of the broad ligaments, and the molecule of water in equilibrium by the uterus.

When the pelvic floor is relaxed, the introitus vaginæ gapes, the vaginal walls are not in contact, and the support to the cervix is greatly impaired. Instead of resting on the pelvic floor, the cervix really becomes a part of the pelvic floor (Fig. 282). Intra-abdominal pressure acting upon the uterus and tending to force it downward must then be met largely by the strength of the uterine ligaments. Every act of the woman that increases intra-abdominal pressure tends to augment the strain upon the pelvic structures, so that they slowly give way and the uterus descends through the vagina. Another factor in the descent of the uterus is the pull upon the cervix by

the unsupported vaginal walls. As a result of relaxation of the pelvic floor, before there is any descent of the uterus, a cystocele or a rectocele may be produced. Attempts at defecation and urination give rise to a protrusion of the anterior or the posterior vaginal walls, or both, as the case may be, and this exerts a downward pull upon the cervix.

The predisposing cause of descensus and prolapse may be congenital deficiencies in the pelvic and uterine supporting structures. This explains the complete prolapse in nulliparous women which occasionally occurs in those who habitually work hard or do heavy lifting.

Descent or prolapse of the uterus is frequently associated with viscero-

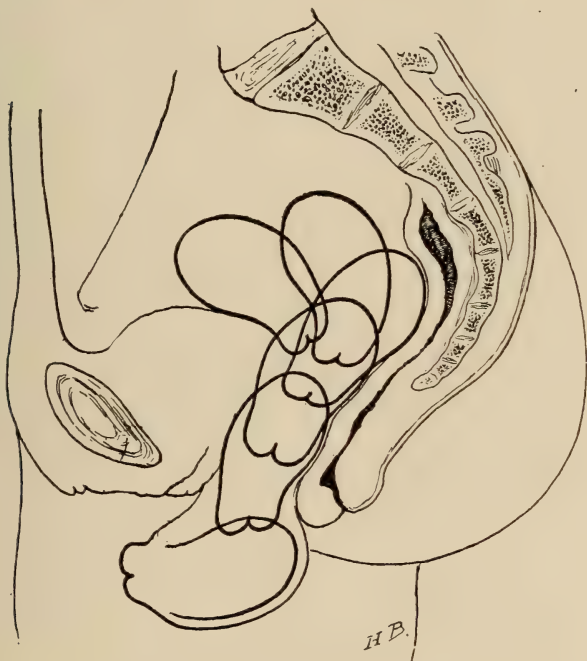


FIG. 283.—Schematic outline, showing various steps in the development of procidentia uteri. The uterus turns backward as it begins to descend; downward displacement of the uterus becomes more marked after the axis of the uterus lies in the axis of the vagina.

ptosis. The latter may be coincident, depending upon the same factors that produced the prolapse, or it may precede the condition and be an evidence of a general lack of tone in the ligamentous structures formed by the peritoneal reflexions in the abdominal wall and in the pelvic diaphragm. The uterus has been said to undergo acute prolapse in a previously normal woman as the result of sudden and unusually violent increase of intra-abdominal pressure, as by lifting a heavy weight. Such an occurrence must be exceedingly rare. In apparent cases of this description it may be taken for granted that there was a preceding slow but progressive descent of the uterus, with overstretching of its supports, which at the time of the prolapse suddenly gave way and produced pain and other localizing symptoms.

Descensus of the uterus progresses slowly (Fig. 283). As the uterus traverses the vagina the vaginal walls become inverted. When the cervix has fallen so low that it presents at the vaginal introitus, the condition is usually known as prolapse (Fig. 284).

The degree of uterine prolapse is best described by mentioning the position of the cervix (Fig. 283)—that is to say, prolapse of the uterus with the



FIG. 284.—Prolapse of the uterus; cervix presenting at the vaginal orifice. Vesical and rectal diverticula.

cervix at the vaginal entrance, prolapse of the uterus with the cervix an inch outside of the vaginal orifice, etc. When the entire uterus is displaced beyond the introitus, the condition is known as *procidentia*.

Preceding or accompanying the descensus and prolapse there are usually pouchings of the anterior vaginal wall with the bladder, and of the posterior vaginal wall with the rectum. These may be regarded as vesical and rectal diverticula. In rare cases, as the vagina becomes inverted, it becomes separated from the contiguous vesical and rectal walls, so that there may be

complete prolapse of the uterus and total inversion of the vagina, without much participation of either the bladder or the rectum.

Although the cervix may project beyond the vulva in some cases of prolapse, this does not necessarily signify that the body of the uterus is pro-

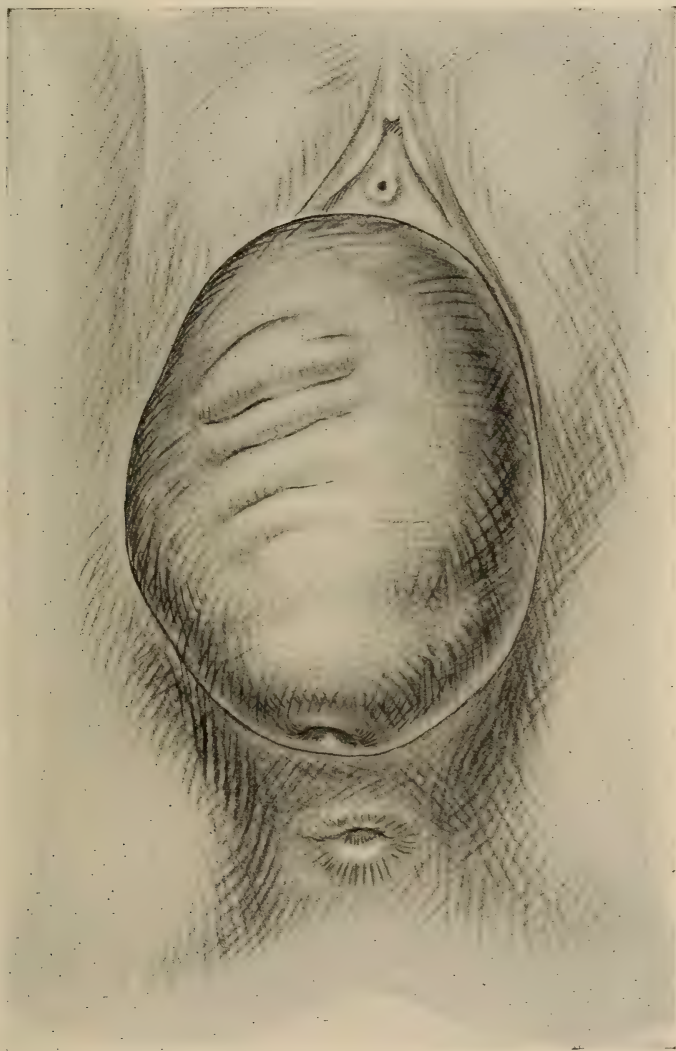


FIG. 285.—Complete prolapse of the uterus with bladder diverticulum.

portionately displaced. On the contrary, in numerous instances the cervix seems particularly prone to descend, whereas the body and the fundus remain more or less fixed. This results in a thinning and an overstretching of the supravaginal cervix; when this occurs the condition is known as a *partial prolapse* of the uterus with *supravaginal elongation and thinning of the cervix*.

Accompanying descensus or prolapse, any of the lesions of the cervix due to labor may be present. The cervix seems to show an especial tendency to become hypertrophied. This may be the result of mechanical irritation incident to the displacement, or the hypertrophy may have been primary and in itself a contributing factor.

In cases of total prolapse of the uterus, or procidentia, the projecting mass often forms a mechanical hindrance to walking. At those points where the pressure is greatest and most continuous the mucous membrane is likely to undergo ulceration. If a vesical diverticulum is present, there may be a constant residuum of urine in the bladder, which finally causes a low-grade cystitis. If a rectal diverticulum exists, hemorrhoids are prone to follow as the result of the difficulty in defecation thus occasioned.

Symptoms.—The symptoms of descensus or prolapsus of the uterus depend upon the degree of displacement and upon the accompanying lesions. The most characteristic complaint is of a bearing-down sensation in the lower abdomen, with a feeling of loss of support, backache, and pain in the thighs, exaggerated by exertion, and relieved by the recumbent posture. With these symptoms there may be associated: frequency and profuseness of the menstrual flow from pelvic congestion; leucorrhœa from inflammation of the vaginal or the cervical mucosa and overgrowth of the endometrial glands; and vesical and rectal irritability from vesical and rectal diverticula.

Diagnosis.—The diagnosis of the milder grades of descensus is made upon the findings of digital examination—*i.e.*, the cervix and the entire uterus are found at a lower level than normal. The vagina is usually shortened, and the axis of the cervix corresponds directly with that of the vagina, the body of the uterus, as a rule, being in retroversion. The uterus may, however, be anteflexed, particularly when the round ligaments are strong and the cause of the descensus is chiefly due to a pull upon the cervix from below.

In extreme degrees of descensus and of prolapse, the diagnosis can be made simply by inspection; upon directing the woman to bear down, the cervix appears either close to or at the vulvar orifice, or the entire uterus may protrude from the vaginal introitus.

When the patient has been in bed for a time, the degree of descent may not be apparent at once, nor be rendered so immediately by the patient's efforts. Under such circumstances, if the cervix is caught with a tenaculum and gently drawn downward, the desired information will be secured.

The presence of a rectal diverticulum can easily be determined by making a digital examination of the rectum; the presence of bladder diverticulum can be determined by the introduction of a sound. It is always advisable to ascertain exactly, by means of bimanual palpation, the position of the fundus of the uterus, so as to determine whether or not one is dealing with a complete or a partial prolapse.

Treatment.—The treatment of descensus of the uterus and prolapse depends upon the amount of downward displacement, the age of the patient, and the associated conditions. During the reproductive period the lesser degrees of descensus may be treated in the manner described for retroversio-

flexion, with which they are almost invariably associated. In the more marked degrees of descensus and prolapse, a Smith or a Hodge pessary may be maintained in position only with difficulty, on account of the relaxed condition of the perineum. Although one of the types of ring pessary will hold the uterus up, it may not maintain it in ante-position, so that the treatment will be unsatisfactory. Furthermore, ring pessaries, with the exception of the simple hard-rubber forms, interfere more or less with coitus, and may be objectionable from that standpoint.

With the exception, therefore, of the lesser degrees, in which the uterus can be supported and maintained in normal position by a Smith or Hodge pessary, operation is the treatment of choice. In aged women and in those who present some contraindication to operation, non-operative treatment must of necessity be adopted.

The mechanics of support by a ring pessary differ from the action of the Smith or the Hodge pessaries (Fig. 286). The latter not only support the uterus in position, but they throw the fundus forward. The ring pessary finds its support in the walls of the vagina, the muscles of the perineal floor, and the rami of the pubes. If the diameter of the vaginal fornices exceeds that of the vaginal introitus, a hard-rubber ring pessary may be used; it should be of such a size as to keep the vaginal fornices spanned, the tissues surrounding the vaginal outlet helping to hold the pessary in place. If the vaginal introitus is very much smaller, it may be impossible to introduce a hard-rubber ring pessary that will span the vaginal fornices. Under such circumstances a soft-rubber pessary that can be compressed at the time of introduction may be selected.

When it is necessary to use a ring pessary that is more than two inches in diameter in a case of descensus or prolapse with cystocele, the hard-rubber simple ring type is not always satisfactory, for the anterior vaginal wall shows a tendency to prolapse through the ring. Under these circumstances the disk form may be used with advantage. The broad surface of the disk forms a satisfactory support for the anterior vaginal wall and base of the bladder.

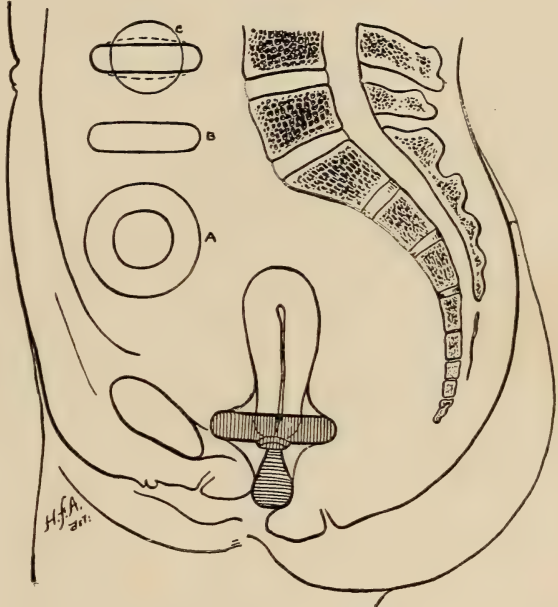


FIG. 286.—The principle of support of a Menge pessary. The knob or rudder keeps the rim with its greatest diameter transverse to the axis of the vagina; in such relation as indicated at A, it requires a canal of larger caliber to permit its escape than when it turns edge-wise as at B; in this position it can pass through a canal of considerably smaller caliber, C.

When the diameter of the outlet is greater than that of the vaginal fornices, and the ring does not secure sufficient support from the vaginal walls and pelvic floor, the difficulty may be overcome by utilizing the support afforded by the bony arch of the symphysis and rami of the pubes. This can be a factor only where the plane of the pessary is maintained more or less at right angles to the axis of the vagina—in other words, when it presents its surface, and not its edge, at the vaginal outlet. The ordinary ring pessary will not maintain the desired position, but Menge has devised a form that overcomes this difficulty. This has, in addition to the ring, an attachable stem that lies in the axis of the vagina, and therefore keeps the plane of the pessary at right angles. The Menge pessary has been a very valuable addition to the non-operative treatment of descensus and prolapse. It has rendered nearly every case amenable to this plan of treatment, so that pessaries of the Goddard type may be regarded as almost obsolete.

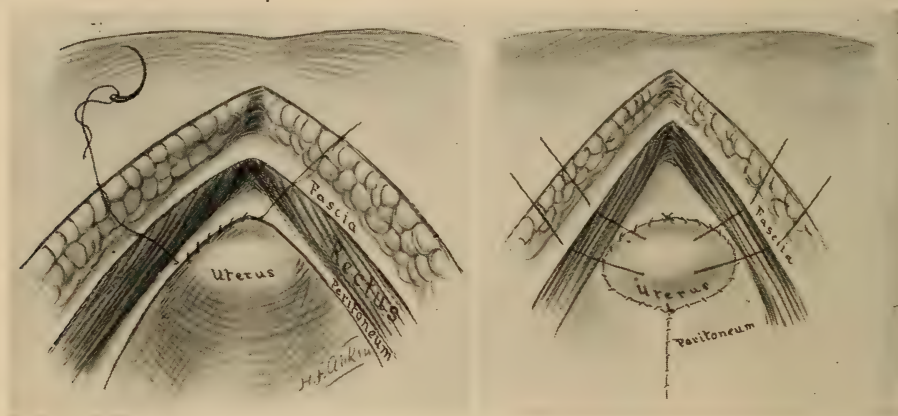


FIG. 287.—Extraperitoneal fixation of fundus. Step 1. FIG. 288.—Extraperitoneal fixation of fundus. Step 2.

The general rules of treatment by the pessary are the same here as in cases of retroposition. In aged patients, particularly, it is advisable not to allow the device to remain in place for more than a month at a time.

The operative treatment of descensus and prolapse combines the operations necessary for restoring the integrity of the pelvic floor, and those that suspend or fix the uterus at the normal or slightly above the normal level. Usually, in the child-bearing woman, some form of cystopexy and perineorrhaphy must be performed, in conjunction with Simpson's, Baldy's, or Coffey's operation. It is in these cases particularly that shortening of the uterosacral ligaments, when combined with the other operations, may be serviceable. A fixation operation is never selected unless the woman has passed the menopause or has been artificially rendered sterile. Plastic work in prolapse is, as a rule, more extensive than in descensus, and as prolapse occurs more frequently in older women, fixation operations are oftener desirable. The choice of the particular type of fixation operation for the individual case depends upon the associated conditions. Vaginal fixation may be the operation of choice if, by reason of obesity or the expressed wish

of the patient, an abdominal incision is objectionable. Interposition of the uterus between the bladder and anterior vaginal wall is especially indicated when a cystocele is a prominent feature of the case, when the uterus is normal in size, and when the cervix does not prolapse beyond the vaginal introitus.

Supravaginal hysterectomy and fixation of the stump to the abdominal wall are particularly suitable when relaxation of the uterine ligaments is extreme and the fundus can be drawn out of the incision to such an extent that the stump of the cervix, after removal of the body of the uterus, will just reach the anterior abdominal parietes. Supravaginal hysterectomy and suspension of the stump by the round ligaments may be selected when

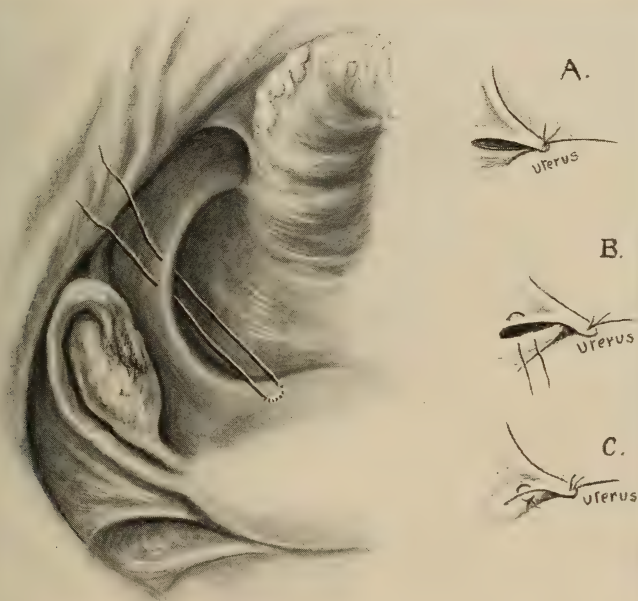


FIG. 289.—Shortening of uterosacral ligaments.

relaxation of the uterine ligaments is not extreme, but the body of the uterus is enlarged and heavy and it is desirable to remove it.

Simple extraperitoneal fixation of the fundus uteri may be selected when, upon pulling up the uterus as far as it will go, the fundus just about reaches the anterior abdominal wall, the body of the uterus is not enlarged, and there is no indication for hysterectomy (Figs. 287 and 288).

In operations for descensus and prolapse, the treatment of the cervix deserves particular mention. During the reproductive period high amputation should be avoided. Trachelorrhaphy is the procedure of choice, and should be selected unless the cervix is so greatly hypertrophied or there is such a distribution of Nabothian cysts that nothing short of amputation will restore the cervix to a satisfactory condition. In women past the child-bearing period high amputation of the cervix is usually advisable, since it

lessens the weight of the uterus and removes the vaginal portion, which, if let alone, might predispose to a recurrence of descensus, guiding the uterus down through the vagina just as the olive tip of a bougie guides it through the urethra. After high amputation the vaginal vault is concave, the tissues are more or less fixed to the bases of the broad ligaments, and are less disposed to downward displacement. An exception to this may be noted in the interposition operation. High operation does not lend itself to the technical execution of the latter, and if the condition of the cervix is such that amputation is necessary, some other form of uterine fixation should be selected.

As a preliminary step in any case that is to be subjected to operation, and in non-operative cases for palliative purposes, the prolapsed uterus may be restored to its normal position and held there by vaginal tampons of gauze or cotton. Either of these materials should be applied in the form of a long strip, first being disposed in a circular manner about the cervix until the whole vaginal vault is filled, pressure being then exerted laterally upon the vaginal fornices. Below this the packing may be loose. A dusting powder (boric acid or zinc stearate) or an ointment (petrolatum, zinc ointment, etc.) may be applied to the gauze or cotton. This tamponade forms a large spheric mass that embraces the cervix and finds support upon the lateral walls of the pelvis and upon the pubic rami. Such a tampon must not be left in place for more than twenty-four hours at a time.

In case of ulceration of the vaginal mucosa in prolapse of the uterus, the organ should be replaced in the manner described, and kept there for several weeks before operation, the ulcer being cleansed and touched with silver nitrate (2 per cent.) daily before the tamponade is reintroduced. Within a week or two this treatment will result in healing of the ulcerations, and the mucous membrane of the vagina and the submucous areolar tissues will be less œdematous and in a much more favorable condition for operation.

Vaginal Fixation.—Vaginal fixation of the uterus is an operation that has a very limited field of application. The operation is especially useful when there is a serious contraindication to an abdominal operation, such as excessive fat, or if the patient herself wishes to avoid an abdominal incision. It should be reserved for women who have passed the child-bearing period. If used in others, it must be in conjunction with an operation to render the individual sterile. In performing this operation a midline incision is made through the anterior vaginal wall, from a point one centimeter posterior to the external urinary meatus to the point where the vaginal wall joins the anterior lip of the cervix. Here the midline incision is crossed by a transverse incision that divides the vaginal wall along the line of its attachment to the cervix. The bladder is separated from the anterior vaginal wall and from the anterior surface of the uterus, and pushed up until a point is reached on the anterior uterine wall more than half-way between the internal os and the fundus (Fig. 220). It is always advisable to open the peritoneum. The anterior surface of the uterus is now sutured to the anterior vaginal wall, the bladder being pushed up out of the way and the fixation sutures so disposed as to close the peritoneal opening.

Watkins' Operation.—**Interposition of the Uterus between the Bladder and the Vagina.**—Interposition of the uterus is indicated chiefly in descensus

or minor degrees of prolapse with particularly marked cystocele. The operation is not advisable in cases of complete prolapse, since in order to make it effective some support must be left in the uterosacral ligaments and the tissues surrounding the cervix and the vaginal vault. (See page 221.) The anterior surface of the uterus and the base of the bladder are exposed by means of the T-shaped incision described under the head of vaginal fixation. The bladder is separated from the anterior vaginal wall and the cervix by blunt dissection and pushed upward. The vesico-uterine fold of peritoneum is divided and the uterovesical pouch is opened. The pelvis is then carefully explored with the finger, in order to determine the presence of adhesions or of intrapelvic disease. If the fundus is small and no adnexal complications exist, it is drawn through the opening in the uterovesical pouch, and the anterior edge of the peritoneum is united to the posterior surface of the uterus below the fundus somewhat above the position of the internal os. The excess of the vaginal wall is now excised from either side of the median line, and united over the anterior surface of the uterus, the latter being fixed in its new position by several interrupted catgut sutures. This operation must be supplemented by some form of perineorrhaphy (Figs. 222 and 223).

Fixation of the Uterine Stump after Supravaginal Hysterectomy.—The operation of supravaginal hysterectomy is carried out in the usual manner, without attaching the round ligaments to the cervix, up to the point of peritonealization of the raw surfaces. Instead of covering in the cervical stump with peritoneum, it is left bare, transfixed with two chromic catgut (No. 2) sutures, and drawn up into the lower end of the abdominal incision. The peritoneum of the lower angle of the incision is then united to the anterior surface of the cervix along the peritoneal reflection. The peritoneum on either side is now sutured over the ovarian and round-ligament stumps and the cut surface of the broad ligament. The peritoneum of the abdominal incision is then attached to the lateral and posterior surfaces of the cervix and closed above this point. Each end of the sutures transfixing the cervix is now carried through the fascia of the abdominal wall on its corresponding side, the under surface of the fascia being exposed by blunt dissection. The fascia is brought together with catgut in the usual manner, and the cervical sutures are tied. The raw surface of the cervical stump is thus brought into contact with the under surface of the fascia, and a broad and secure area of fixation is the result. The principles underlying this operation are the same as those of extraperitoneal fixation of the fundus (Figs. 287 and 288).

Ante-position, Latero-position, Retro-position, Elevatio Uteri, and Torsion.—These variations from the normal in the position of the uterus are of less importance than those previously discussed. They practically never produce symptoms other than those characteristic of the conditions with which they are associated.

The uterus may be pushed forward against the symphysis (*ante-position*), to one side toward the wall of the pelvis (*latero-position*), and backward into the hollow of the sacrum (*retro-position*) by a tumor that crowds the uterus out of its way or by adhesions that, by contraction, draw the uterus out of its normal position.

The uterus may also be elevated (*elevatio uteri*) considerably above its

usual position by a tumor developing from the cervix or by adhesions forming between the fundus and the abdominal viscera. The uterus may be elevated by an abdominal tumor of uterine origin, or displaced downward by an ascites or pseudomyxoma peritonæi.

The uterus may be twisted (*torsio uteri*) by the torsion of tumors attached to it or by an enlarged uterus twisting on the cervix as a pedicle. Latero-position of moderate degree and torsion are likewise to a certain extent physiologic, *e.g.*, the normal rotation to the right of the pregnant uterus, and have no pathologic significance.

The treatment of all these abnormalities must, of course, be directed toward the primary source of the trouble, *i.e.*, tumors must be removed and adhesions broken up or divided. In very rare cases it may be advisable to attempt to correct the latero-flexion of an ill-developed uterus.

INVERSION OF THE UTERUS

Etiology and Pathology.—Inversion of the uterus, or turning of the uterus inside out, usually takes place at the end of labor, when the uterine muscle is relaxed and the lower uterine segment and the cervix are widely dilated. The improper management of the third stage of labor is usually responsible for this condition. Too forcible applications of Créde's method, pulling upon the umbilical cord, or faulty methods of manual extraction of an adherent placenta may be the exciting cause.

If, in employing Créde's method, the fundus is too vigorously compressed and depressed, the organ may be driven down through the lower uterine segment and cervix, the walls everting as it passes. If the placenta is firmly attached to the uterine wall at the fundus, traction on the cord may cause inversion of the fundus. If the hand is introduced into the uterus to detach an adherent placenta, and, having accomplished this, the hand grasping the placenta is immediately and forcibly withdrawn, it may act like a piston in a syringe and draw the organ inside out. Forceps delivery of a foetus with an exceptionally short cord has been said to be a cause of acute inversion.

Inversion of the uterus other than puerperal may occur as a complication of intra-uterine tumors that become pedunculated and are extruded through the cervix by uterine contraction. If the pedicle of the neoplasm is broad and attached to the fundus, inversion may take place.

Symptoms.—Acute inversion is an alarming condition, and is usually accompanied by serious hemorrhage and shock. It may take place at the end of the second stage of labor, but it usually complicates the manipulations attending delivery of the placenta. At the moment of occurrence the patient complains of severe pain, the hemorrhage is excessive, and a state of shock rapidly develops. Hemorrhage and shock are less severe if the placenta is still attached to the uterine wall. A globular pyriform mass protrudes from the vulva or presents at the vulvar orifice. If the placenta is still attached, the condition is apparent. If the placenta has been delivered, the condition must be differentiated from extrusion of a submucous pedunculated fibroid. In the former, examination of the fundus reveals a funnel-shaped depression; in the latter, the rounded fundus can be felt in its normal

position. The mortality of acute inversion is 30 per cent. Inversion occurring slowly, as from the traction of a fibroid, or when of puerperal origin and allowed to remain unreduced, is the form with which we are most concerned here. The symptoms consist of irregular hemorrhage, menorrhagia, and leucorrhœa. Upon examination a pear-shaped tumor is found projecting from the vaginal vault. The surface is bright red, the growth bleeds readily, and the pedicle is surrounded by the rim of the cervix.

Bimanual examination shows the normal contour of the fundus to be missing, and in its place there is a cup-shaped depression that can readily be distinguished by a digital examination per rectum. A sound introduced along the pedicle of the tumor, and between it and the rim of the cervix, soon meets with the resistance of the inverted cervical tissue. The condition bears some resemblance to a uterine polyp or to a submucous pedunculated fibroid tumor. The principal differential and diagnostic signs are the following: The fact that the surface of the tumor is covered with endometrium, in which the tubal orifices may be distinguished; obliteration of the uterine cavity; and the cup-shaped depression at the fundus.

Treatment.—In acute puerperal inversion, if the patient is in an extreme state of shock and the surroundings are unfavorable, simple tamponade and general supportive treatment should first be undertaken; under opposite circumstances immediate replacement should be attempted. The woman should be placed in the Trendelenburg position, and an effort be made to push the inverted fundus up through the cervix. This procedure will be favored by grasping the entire fundus with the hand, compressing it as much as possible, and then making an effort to push it past the cervix. If the effort is successful, as the fundus is restored to its normal position, the inversion is reduced. When the inversion has persisted for some time and partial involution has occurred, replacement is considerably more difficult. Division of the cervical ring is almost invariably required, but even when this is performed replacement is often impracticable. In most cases of long standing and in women past the age of thirty-five hysterectomy is the procedure of choice.

At times the inverted portion, owing to interference with its blood supply, becomes necrotic. Under such circumstances the gangrenous part may be removed with the cautery knife, and after the stump becomes covered with healthy granulations, the remains of the uterus may be removed by vaginal or abdominal hysterectomy.

BIBLIOGRAPHY

- ALEXANDER, W.: "A New Method of Treating Inveterate and Troublesome Displacements of the Uterus." *Med. Times and Gazette*, 1882, i, 327.
- ANSPACH, B. M.: "Inversion of the Uterus, the Treatment in Cases Complicated by Necrosis of the Inverted Part." *Amer. Medicine*, viii, No. 22, November 26, 1904.
- BALDY, J. M.: "A Method of Preventing Vaginal Prolapse Following Abdominal Hysterectomy." *Am. Jour. Obst.*, 1897, xxxv, 81; *Ibid.*: "Retroadisplacements of the Uterus and Their Treatment." *N. Y. Med. Jour.*, 1903, lxxviii, 167; *Ibid.*: "Prolapse of the Uterus." *Trans. Amer. Gyn. Soc.*, 1912, xxxvii, 385.
- BALLENTYNE, J. W., AND THOMSON, J.: "Congenital Prolapsus Uteri." *Amer. Jour. Obst.*, 1897, xxxv, 161.
- BOVÉF, J. W.: "The Surgical Treatment of the Uterosacral Ligaments Through the Vagina in Retroversion of the Uterus." *J. A. M. A.*, 1902, xxxix, 12; *Ibid.*: "Opera-

- tions on the Uterosacral Ligaments in the Treatment of Retroversion of the Uterus." *Am. Gyn.*, 1902, i, 35.
- BRICKNER, S. M.: "Results of the Dudley Operation." *Surg., Gyn. and Obst.*, 1911, xiii, 510.
- COFFEY, R. C.: "Surgical Treatment of Displacements of the Uterus." *Denver Med. Times*, 1904-5, xxiv, 339, 362; *Ibid.*: "The Principles on Which the Success of the Surgical Treatment of Retrodisplacements of the Uterus Depends." *Surg., Gyn. and Obst.*, 1908, vii, 383-408.
- DUDLEY, E. C.: "A Plastic Operation Designed to Straighten Out the Anteфлекed Uterus." *Amer. Jour. Obst.*, 1891, xxiv, 142.
- FERGUSON, A. H.: "Preliminary Report of Anterior Transplantation of the Round Ligaments for Displacements of the Uterus." *J. A. M. A.*, November 18, 1899, xxxiii, 1275.
- GILLIAM, T.: "Round-Ligament Ventrosuspension of the Uterus." *Amer. Jour. Obst.*, 1900, xli, No 3.
- HOLDEN, F. C.: "Chief Factors in Failure of Operations for Retrodisplacement of the Uterus." *Trans. Sec. O. G. and A. S., A. M. A.*, 1914, 279.
- HUTCHINS: "Anteposed Uterus and Pelvic Symptoms." *Trans. Sec., O. G. and A. S., A. M. A.*, 1916, 63.
- KELLY, H. A.: "Hysterorrhaphy." *Am. J. Obst.*, 1887, xx, 33; *Ibid.*: "Suspension of the Uterus." *J. A. M. A.*, 1895, xxv, 1079.
- MARTIN: *Der Haft-Apparat der Weiblichen Genitalien*. Berlin, 1911.
- MONTGOMERY, E. E.: "Modern Method of Treatment of Prolapsus Uteri." *Trans. Amer. Gyn. Soc.*, 1912, xxxvii, 376.
- NOBLE, C. H.: "Suspensio Uteri With Reference to Its Influence Upon Pregnancy and Labor." *Trans. Amer. Gyn. Soc.*, 1896, xxi, 247; *Ibid.*: "Mechanical Principles Involved in the Cause of Backward and Downward Displacements of the Uterus." *Trans. Amer. Gyn. Soc.*, 1914, xxxix, 238.
- OLSHAUSEN, R.: "Ueber ventrale Operation bei Prolapsus und Retroversio Uteri." *Cent. f. Gynäk.*, October, 1886, No. 43, 698.
- POZZI, S.: "On the Surgical Treatment of a Most Frequent Cause of Dysmenorrhœa and Sterility in Women." *Surg., Gyn. and Obst.*, 1909, ix, iii.
- REYNOLDS, E.: "Anteflexion of the Cervix and Spasm of the Uterine Ligaments in Relation to Retroversion, Dysmenorrhœa and Sterility." *Surg., Gyn. and Obst.*, 1911, xiii, 17; *Ibid.*: "Forward Fixation of the Cervix a Predisposing Cause of Some Retro-deviations of Uterus. Operation for Its Release." *Surg., Gyn. and Obst.*, 1914, xix, 588.
- SCHULTZE: *The Pathology and Treatment of Displacements of the Uterus*. N. Y., 1888.
- SIMPSON, F. F.: "Intra-abdominal but Retroperitoneal Fixation of the Round Ligaments for Posterior Uterine Displacements." *Trans. Southern Surg. and Gyn. Soc.*, 1902, xv, 223.
- SOMERS, G. B., AND BLAISDELL, F. E.: "The Anatomy and Surgical Utility of Sacro-Uterine Ligaments." *J. A. M. A.*, 1913, lxi, 1247, No. 14.
- TANDLER AND HALBAN: *Anatomie u. Aetiologie der Genitalprolapse beim Weibe*. Wien u. Leipzig, 1907.
- WATKINS, T. J.: "The Treatment of Cystocele and Uterine Prolapse After the Menopause." *Am. Gyn. and Obst. Jour.*, 1899, xv, 420; *Ibid.*: "Treatment of Cases of Extensive Cystocele and Uterine Prolapse." *Surg., Gyn. and Obst.*, 1906, ii, 639; *Ibid.*: "Treatment of Cystocele and Uterine Prolapse During the Child-bearing Period." *Trans. Amer. Gyn. Soc.*, 1917, xlii, 594.
- WEBSTER, J. C.: "A Satisfactory Operation for Certain Cases of Retroversion of the Uterus." *J. A. M. A.*, 1901, xxxvii, 913.
- WINTER, G.: *Zur Pathologie des Prolapses*. *Fest. f. C. Ruge*, 1896, 22.

CHAPTER XVI

DISEASES OF THE ENDOMETRIUM AND MYOMETRIUM

Endometritis.—Endometritis, or an inflammation of the mucous membrane lining the body of the uterus, may be acute or chronic.

Acute endometritis is the result of infection of the endometrium by the gonococcus during the course of gonorrhœal disease, or of infection by the staphylococcus, streptococcus, or other pus-producing organisms following abortion, premature labor, or intra-uterine manipulations or operation. Acute gonorrhœal endometritis is a sequel of gonorrhœal cervicitis, and usually develops about the time of the menstrual period; or it may follow miscarriage, labor, or local applications to the cervix. It is marked at times by sudden cessation of the menstrual flow, a profuse discharge of purulent matter from the cervix, pyrexia, pain in the lower abdomen, and some of the symptoms of pelvic peritonitis. It is, indeed, very difficult to distinguish the latter clinically from acute gonorrhœal endometritis. Acute gonorrhœal endometritis frequently extends speedily into the tubes on either side, and thence to the pelvic peritoneum.

Whether or not it does so, if the conservative measures presently to be outlined are adopted, the inflammatory process gradually subsides, although the disease does not tend to undergo a complete cure, but is likely to become subacute or chronic in type and most persistent. The fever, pain, etc., disappear, the uterine discharge becomes less purulent in character, and may finally contain only a small amount of pus. In the chronic stage, as a result of the previous acute inflammation, the endometrium often shows hypertrophy of the glands, so that there are hypersecretion and a considerable amount of leucorrhœal discharge.

The infection remains, and the gonococcus, after invading the depths of the endometrial glands, lies dormant, not giving rise to any active symptoms. Certain forms of irritation may, however, light up the infection when transplanted into fresh soil, and an active inflammation may be set up.

Acute endometritis following labor, abortion, or instrumentation, and caused by the ordinary pyogenic organisms, is usually accompanied by a chill or chilly sensations, elevation of temperature, and increased pulse-rate. The pain may be very moderate, and the discharge is often insignificant, unless placental or decidual tissue remains within the uterus. The patient may be greatly prostrated as the result of absorption of toxic products with localizing symptoms appearing. Such an infection of the endometrium usually precedes a cellulitis, pelvic peritonitis, or ovarian abscess, the bacteria penetrating the wall of the uterus directly from the original nidus of infection, and reaching the periuterine tissues by way of the lymphatics.

An acute endometritis of this variety may undergo complete and spontaneous cure if the resistance of the patient is sufficiently strong to over-

come the toxins elaborated by the infecting organisms and inhibit their growth. Following such an acute endometritis there may be no permanent alteration in the structure of the endometrium, and, indeed, this is the rule unless the infection has involved the uterine wall and the surrounding organs and tissues. Even in the latter event after the infection is overcome or localized the parts may return to the normal.

Diagnosis.—The diagnosis of endometritis is frequently indicated by the history and symptoms. There is considerable tenderness in the lower abdomen, with rigidity of the abdominal wall and a tendency to distention. The uterus is enlarged and may be soft and tender. The cervix is often more patulous than normal. As a rule, there is a profuse purulent discharge, although in cases of pure streptococcus infection there may be none whatever. (See Acute Pelvic Peritonitis, Chapter XXI).¹

Treatment.—The treatment of all forms of acute endometritis is practically the same. Only those post-abortal or puerperal cases, in which there are marked evidences of retention within the uterus of placental or decidual tissue (profuse putrid discharge), lie within the operative sphere. In such cases it may be advisable gently to dilate the cervix and then, with a placental forceps or a dull curette, make sure that tissue remnants and detritus have been cleared away. The remainder of the treatment is purely non-operative. The patient should be kept quietly in bed, and an ice-bag should be applied to the lower abdomen. The bowels should be moved by enemas. The patient should be supported by nutritious food and stimulants, according to the requirements of the case. This will be more fully dealt with in a succeeding chapter.

Chronic Endometritis.—Chronic endometritis is a sequel of acute endometritis. Not infrequently what is regarded as a chronic endometritis is not a true inflammatory process, but rather a hypertrophy of the endometrium.² Such a hypertrophy occurring without a previous acute inflammation may be due to a chronic congestion of the uterine mucous membrane brought about by displacements of the uterus, constipation, chronic

¹ The gonococcus may be identified by the staining of smears made from the discharge. Other organisms may be identified by intrauterine cultures. It is impossible to distinguish clinically between acute endometritis and the first stages of the following conditions, with which it is often combined: acute salpingitis, oöphoritis, cellulitis, pelvic peritonitis, and thrombophlebitis.

² For the diagnosis of chronic endometritis Frankl believes that such symptoms as connective-tissue proliferation, increased vascularity, the occurrence of perivascular fibroblasts, etc., as suggested by Albrecht, are perhaps of theoretic interest, but are too difficult of demonstration to be useful for practical purposes. Diffuse infiltration of the stroma by round cells, or numerous groups of these in the neighborhood of blood-vessels or lymph-spaces, are of considerable significance, provided the specimen was not taken during the late premenstruum or during menstruation, at which times Frankl justly declares such diffuse or scattered round-cell infiltration is entirely physiologic. Frankl, in common with Hitchmann and Adler, believes that the most reliable sign of chronic endometritis consists in the presence of considerable numbers of plasma cells. An occasional cell of this type may be present, Frankl asserts, in normal tissue but when they are found in any number, chronic inflammation may be diagnosed with certainty. Although it is true that in certain types of inflammation round-cell infiltration predominates, whereas in others, particularly in the gonorrhœal form, plasma cells are especially prominent, Fränkel does not believe that the distinction occurs with sufficient regularity to be available for the differential diagnosis of gonorrhœa, as has been claimed by Schriddae and others.

pelvic stasis, and any other cause that increases continuously the blood-supply of the uterine mucosa. Before it was recognized that the endometrium underwent a regular metamorphosis every month, many curetted fragments of endometrium were believed to be significant of chronic glandular endometritis or a glandular hypertrophy, when it is probable that the condition was but one of the normal monthly variations taking place in the structure of the mucous membrane. There is no doubt, however, that forms of chronic endometritis and of glandular hypertrophy occur. A common form of chronic endometritis is the result of an uncured infection by the gonococcus. The acute symptoms subside, but the organisms still remain in the deeper layers of the mucous membrane, giving rise to a persistent low-grade irritation of the endometrium and the presence of a leucorrhœal discharge. Tuberculous and syphilitic endometritis are dealt with in the chapters on Tuberculosis and on Syphilis (XXX, XXXI).

As has previously been noted, instances are seen in which the endometrium is thickened and the glands are increased in number and in size, and yet no actual infection has ever occurred; this is a true glandular hypertrophy. At times the thickening of the mucosa appears in isolated areas and the mucosa presents a polypoid appearance—known as polypoid hypertrophy. In some cases, especially in old women, in addition to the overgrowth of the endometrium and the hypertrophy of the glands, many of the glands become cystic and distended with their secretion; this condition is known as glandular hypertrophy with cystic degeneration. All these forms have been described as varieties of chronic endometritis, and have been given specific titles, as, *e.g.*, glandular endometritis, cystic glandular endometritis, polypoid endometritis, and fungous endometritis, the descriptive adjective in each case indicating the gross anatomic findings.

True chronic endometritis, as well as the hypertrophies just mentioned, very rarely exists alone as the sole and individual lesion of the generative tract. In other words, endometrial lesions of this type are usually combined with other disorders, such as inflammatory diseases of the adnexa, displacement of the uterus, etc.

Symptoms.—The only symptoms that are directly attributable to chronic endometritis are leucorrhœa, menorrhagia, and dysmenorrhœa. Other symptoms believed to be due to chronic endometritis are usually the result of associated conditions, such as chronic pelvic congestion, displacement of the uterus, lacerations of the cervix, or chronic inflammatory diseases of the adnexa. Chronic endometritis alone may prevent conception or be provocative of abortion.

Diagnosis.—The diagnosis may be suspected if there is a persistent uterine leucorrhœa that does not show the thick, tenacious character of a cervical leucorrhœa, and menorrhagia, without any gross lesion in the pelvis. The diagnosis can be confirmed only by performing thorough curettement of the uterus (Fig. 290) and making a careful examination of the uterine scrapings.

Treatment.—The treatment of suspected endometritis that is not accompanied by any other pelvic disorder consists in measures to stimulate the pelvic circulation, deplete the engorged blood-vessels, and promote free

drainage of the endometrial cavity. The treatment is practically the same as that described under Chronic Pelvic Inflammation (Chapter XXI). So far as any direct treatment of the endometrium itself is concerned, the only measure worth considering is curettement, followed by the application of the tincture of iodine or of phenol to the entire uterine interior. The use of local applications to the endometrium is attended with considerable danger, and cannot be carried out unless the patient is anæsthetized and the os is fully dilated. It should never be attempted without the most elaborate aseptic preparation.

Polyyps of the Endometrium.—An endometrial polyp is a growth that springs from the endometrium, being at first, in a measure, a localized hypertrophy of the endometrium. After the hypertrophy has attained a certain size it takes on the proportion of a distinct new formation, and may then be regarded as a polyp. The tumor is composed of glands and stroma, just as the endometrium itself, and the surface is covered by low columnar cells. It varies in size from a tumor no larger than the end of the finger to one

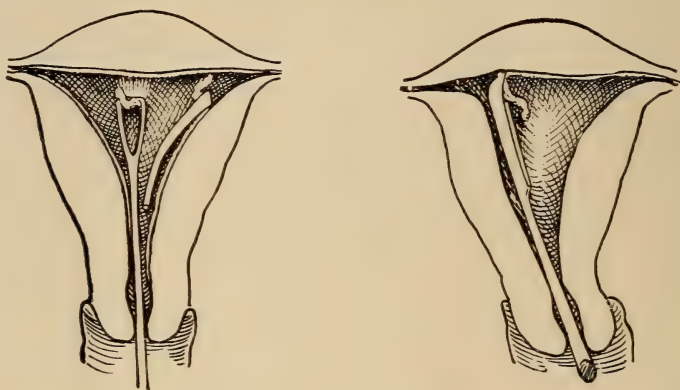


FIG. 290.—Diagnostic curettement (pages 121, 289 and 345).

that entirely fills the uterine cavity. The growth often corresponds in shape to that of the uterine interior, the polyp forming a more or less complete cast. The tumor is usually pedunculated, but small growths may be sessile. Various forms of degeneration may occur: The stroma may undergo myxomatous degeneration; œdema and infiltration with blood are frequent; the surface epithelium may be eroded and the glands become cystic. If actual infection has taken place, the stroma is infiltrated with small round cells or polymorphonuclear leucocytes. Malignant degeneration of the epithelial constituents is not uncommon; carcinoma of the endometrium at times begins in a polyp. If, by reason of uterine contraction and efforts to expel the growth, the pedicle of the tumor becomes attenuated, necrotic changes from strangulation are prone to occur. The uterus may succeed in expelling the growth, and a natural cure thus be afforded.

The symptoms of a polyp are, first, a slightly increased discharge, which may escape the observation of the patient, to be followed later by menorrhagia and metrorrhagia. Bleeding between the periods occurs only after

degeneration or circulatory changes in the tumor have resulted in actual rupture of some of its blood-vessels. In the event of necrosis, the discharge becomes putrid.

The diagnosis of endometrial polyp may readily be made in those cases in which the growth protrudes through the cervix. In these instances inspection alone reveals a soft, globular or flattened, tongue-like growth projecting from the cervix. It is often impossible to distinguish such a tumor

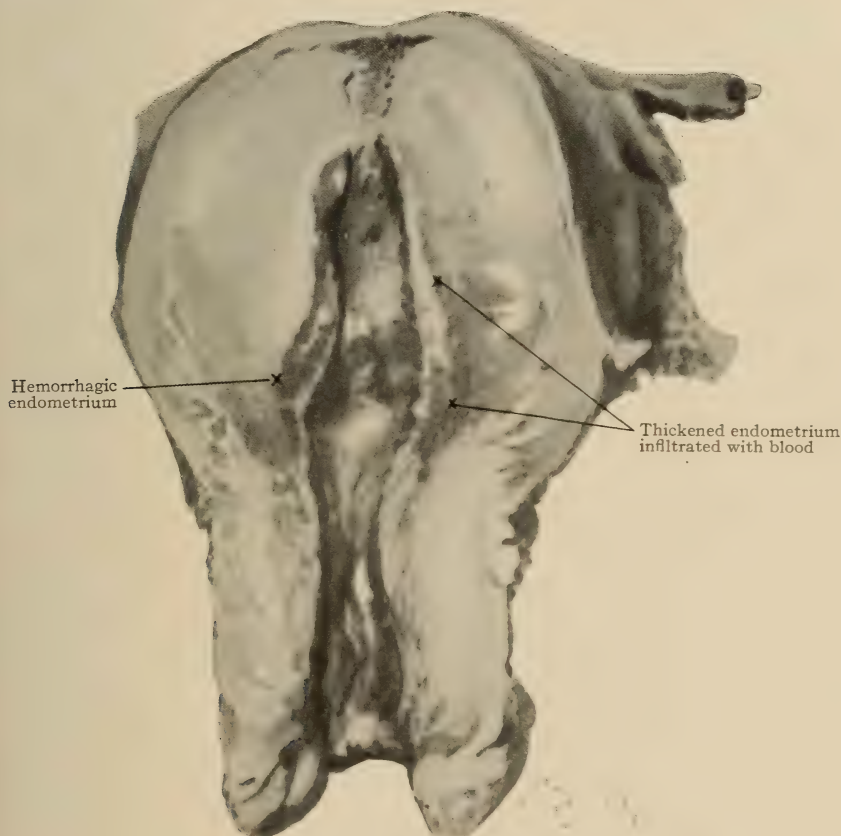


FIG. 201.—Chronic arteriosclerosis or fibrosis uteri: thick hypertrophied uterus; chronic metritis (after Donald); persistent hemorrhage from such uteri has been attributed to sclerosis of the uterine vessels or myofibrosis.

from a cervical polyp, but the treatment is, fortunately, the same for both. A polyp may be suspected in cases of menorrhagia or metrorrhagia in which the patients present no enlargement or irregularity of the uterus or other gross pelvic lesion.

A positive diagnosis may be only possible after dilatation and curettement of the uterine cavity.

Treatment.—As the symptoms presented by polyp always resemble those due to cancer, a positive or a complete diagnosis should be withheld until the growth is removed by avulsion or curettement and subjected to

expert microscopic examination. Avulsion of a polyp should always be followed by curettement unless the tumor projects from the cervix and is infected or necrotic. Under such circumstances the operation may be postponed until a later date, when all indications of infection, etc., have disappeared.

Acute Metritis.—Acute metritis is usually preceded by acute endometritis, and is most often due to infection by the staphylococcus and the streptococcus, or by some of the customary pus-producing organisms present in acute puerperal septic conditions.

The **symptoms** of acute metritis closely resemble those of an acute septic endometritis, being, however, slightly greater in intensity and accompanied probably by a moderate enlargement of the uterus itself. It is quite impossible, but fortunately unnecessary, to differentiate acute metritis from acute endometritis, acute cellulitis, and, in fact, from most of the pelvic inflammatory lesions following post-partal or post-abortion infections.

The **treatment** is essentially the same as that of acute endometritis. Acute metritis is much more likely than the latter to be followed by cellulitis or inflammation of the ovary or of the pelvic peritoneum, and is at times complicated by destruction of foci of tissue in the uterine wall and the formation of intramural abscesses. In some of the most marked cases in which this abscess formation occurs it may be advisable ultimately to perform hysterectomy, but in the acute stages of the disease this operation must not be considered. (See Post-abortion and Post-partal Pelvic Peritonitis, Chapter XXI.)

Chronic Metritis.—Chronic metritis is a sequel of acute metritis, or it may take the form of a slowly produced and subacute affection closely akin to subinvolution. It usually occurs in multiparæ and is marked by hypertrophy or overgrowth of the uterus.³ The organ is considerably larger than

³ Whitehouse has recently shown that syphilis may be a factor of importance in the etiology of chronic metritis.

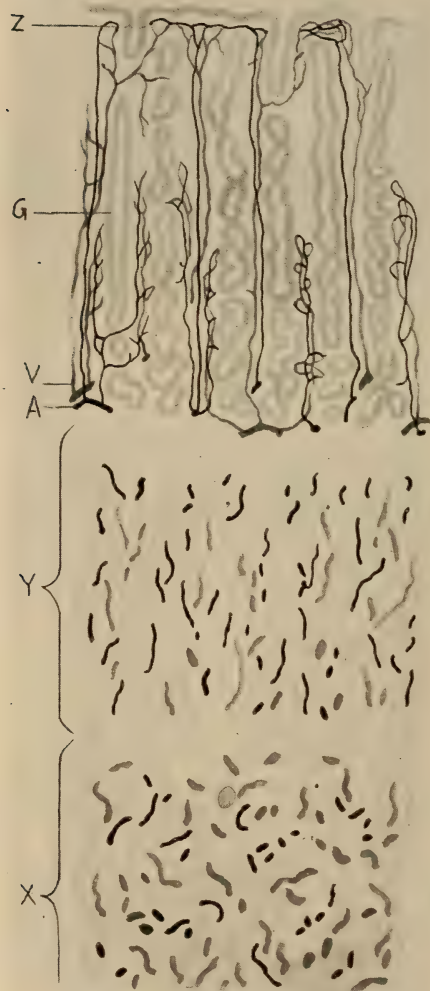


FIG. 292.—Diagrammatic scheme to illustrate vascular channels of uterine wall and endometrium: tortuous vessels of the vascular layer (X); centripetal vessels of the submucosa (Y); subepithelial capillary plexus (Z); arteries (A); veins (V); Glands (G).

normal, and may be remarkably increased in density (Fig. 291). The actual change in the structure of the uterus that accounts for the enlargement of the uterus has been the subject of considerable discussion, but the general opinion is that there is an increase of the fibrous at the expense of the muscular tissue. The production of chronic metritis is closely associated with

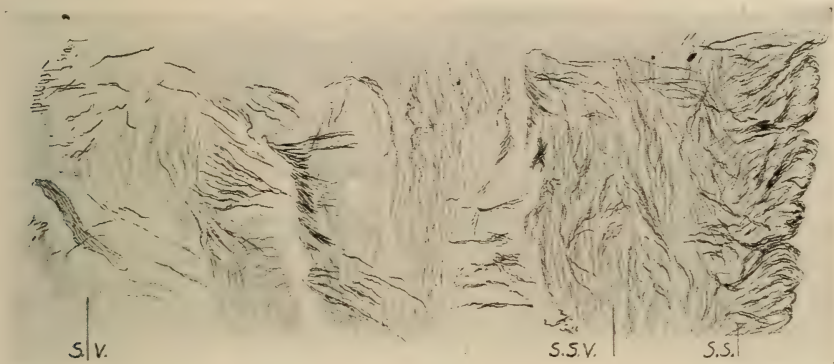


FIG. 293.—Section of wall of nulliparous uterus (Weigert's stain). Observe the finely branching elastica, especially marked in the stratum subserosum (S. S.); note the general centripetal direction of the fibers. Stratum supra-vasculare (S. S. V.); outer limits of stratum vasculare (S. V.).

the process of involution of the uterus, and especially the involution of its vascular supply (Figs. 292 to 297). The vessels of the uterus, which have become greatly hypertrophied during pregnancy, normally degenerate, become obliterated, and undergo absorption during the puerperium. When,

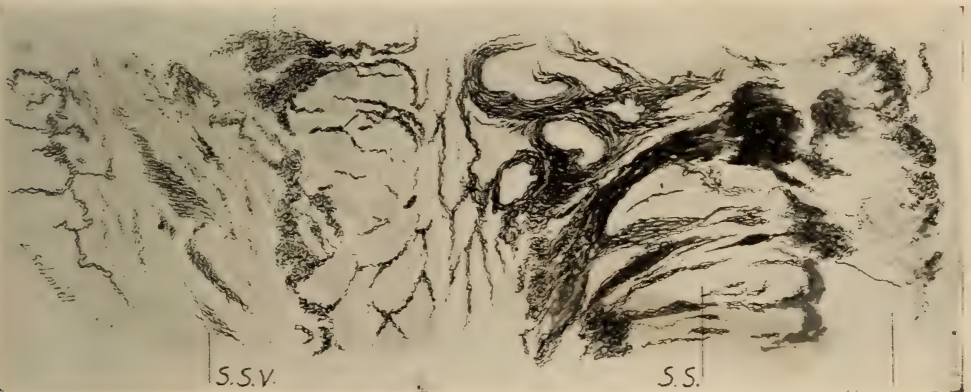


FIG. 294.—Section of wall of multiparous uterus (Weigert's stain). Observe the clumping of the elastica, the curling and coarseness of the fibrils. Subserous layer (S. S.); Supravascular layer (S. S. V.).

for some reason, this process is imperfect, a certain amount of permanent enlargement takes place that predisposes the patient to chronic metritis.

Symptoms.—The symptoms of chronic metritis consist in a serous leucorrhœal discharge, menorrhagia, at times metrorrhagia, a feeling of heaviness or dull pain in the lower abdomen, and backache, especially when the woman is on her feet.

Diagnosis.—On examination the uterus is found to be considerably enlarged and harder than normal. Occasionally it is in a state of retroversion, and at other times it is in anteversion, the fundus lying a little farther forward than normal, the axis of flexion between the body and the cervix being straightened out so that the cervix lies further backward. The cervix is often hypertrophied; the os may be slightly dilated, and Nabothian cysts are not rarely present. The adnexa may show nothing abnormal, although not infrequently light adhesions or simple cysts of one or of both ovaries may be present.

Treatment.—Measures that deplete the pelvic circulation should be



FIG. 295.—Group of arteries from vascular layer of multiparous uterus (Weigert's stain). The internal elastic lamina (i. e. l.) appears well preserved; there is no tendency to clumping of the elastic fibers in the media (M.). The adventitia (A.) presents solid clumps of elastic tissue. Periarterial degeneration.

adopted immediately. These include hot douches, scarification of the cervix, saline laxatives, and enemas, and ergot, hydrastis, and digitalis by the mouth (see Menorrhagia, page 583). The use of boroglyceride tampons may also give good results. If these measures are not speedily effective, it is a good plan to do a curettement of the uterus for exploratory purposes, as well as to deplete the uterus through the resulting hemorrhage, stimulate the uterus to contraction, and remove the hypertrophied endometrium. This may be combined, when feasible, with a high amputation of the cervix. Such a course will often result in permanent cure. If the symptoms persist, it will be necessary to perform supravaginal or vaginal hysterectomy. The remarkable results that have been achieved in late years by the use of radium

make this form of treatment a distinct and hopeful addition to the therapy of metritis and its often intractable hemorrhage (see Radium and Röntgen Ray Therapy, Chapter XL).

Subinvolution of the Uterus.—When the normal regression of the uterus from a puerperal to a resting or non-pregnant state is inhibited and the organ remains enlarged, softened, and congested, subinvolution is said to exist. The muscular and fibrous tissue elements of the uterine wall remain to a certain degree hypertrophied, and the myometrium becomes succulent from infiltration with blood and serum.

Sclerosis and obliteration of the blood-vessels have not progressed to the usual extent, so that they remain more numerous and of larger caliber than in the non-pregnant state. Subinvolution of the uterus is usually accom-



FIG. 296.—Small artery of vascular layer of multiparous uterus (Weigert's stain): the internal elastic lamina (i. e. l.) can still be seen in part well preserved; the adventitia (A) and part of the media (M) are represented by a solid mass of elastic tissue. To the left is a sagittal section through the degenerated coats of the same vessels (S. S.); arterial obliteration.

panied by certain other abnormalities that account for or occur *pari passu* with it; these are: Retention within the uterus of ovular or placental remains; posterior or downward displacement of the uterus, and chronic low-grade infection of the uterine wall, adnexa, or pelvic cellular tissue.

The symptoms of subinvolution consist of hemorrhage (metrorrhagia or menorrhagia), backache, a feeling of weight and pressure in the lower abdomen, leucorrhœa, and possibly vesical or rectal disturbances. If a portion of the placenta or ovum remains within the uterus, there may be a more or less constant foul-smelling and bloody discharge. The entire uterus is uniformly enlarged and softened, and the organ is often displaced backward or downward. The os uteri is patulous. The cervix may exhibit a recent laceration, and the cervical tissue is soft.

Treatment.—The contributory causes should be removed; thus the uterus should be replaced and held in position by means of a pessary, and

placental or decidual remnants should be removed from the uterine cavity with the aid of the curette or the placental forceps. The œdematous condition of the uterine muscle should be relieved by the use of boroglyceride tampons and hot douches. Fecal stasis should be prevented by the administration of a saline laxative daily, followed by a simple enema. The pelvic and uterine circulation should be improved by the exhibition of a pill of ergotin, digitalis, strychnine, and hydrastis (see Menorrhagia, page 583). Later, in order to complete the cure, amputation or repair of lacerated or hypertrophied cervical lips may be undertaken.

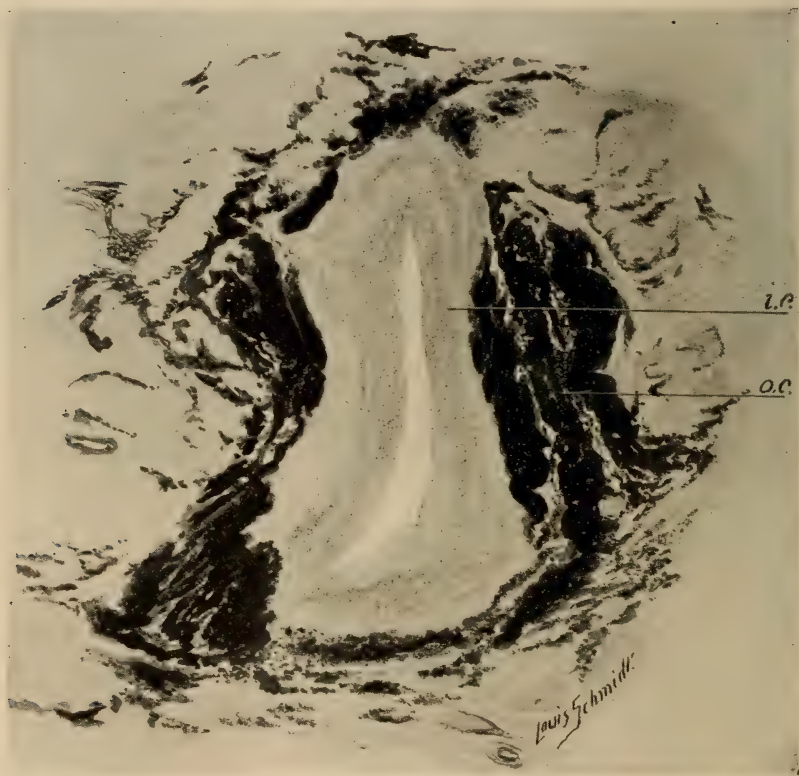


FIG. 297.—Large vein from vascular layer of multiparous uterus (Weigert's stain); the inner coat (i.c.) shows no change; the outer coat (o.c.) is represented by large deposits of elastic tissue in clumps; perivenous degeneration.

Hyperinvolution of the uterus is much less frequent than subinvolution. This is a condition of uterine atrophy following pregnancy, and results from a regression of the constituents of the uterus beyond the normal, so that the various components of the uterine wall are reduced in number and in size. The most frequent cause of the disorder is prolonged lactation. It is associated with anæmia and malnutrition in poorly-fed and overworked mothers. It may occur in the course of certain constitutional diseases, such as diabetes and tuberculosis. Septic infection during the puerperium may predispose to an atrophy of the uterus. A hyperinvolution of the uterus is found in the aged.

The symptoms are those of asthenia and anæmia, the particular symptom that may direct attention to the pelvis is amenorrhœa or scanty menstruation.

It has been claimed that electric (galvanic) stimulation is of value in the treatment of lactation atrophy of the uterus, but in the permanent form produced by septic infection it is of little benefit.

Perforation of the Uterus.—Perforation of the uterus is a not uncommon accident attending the introduction of the uterine sound, dilatation of the cervix, and curettement. The injury may be inflicted as the instrument is being introduced through the cervix, and then involves the lower uterine segment; or it may take place after the instrument has reached the fundus. The accident is recognized by the lack of the normal resistance to the passage of the instrument exerted by the fundus, the identification of the end of the instrument, by suprapubic palpation, free in the abdominal cavity, and by an excess of hemorrhage.

When the accident occurs in the course of an aseptic operation, in experienced hands it will usually be detected at once, and there will be no further mutilation of the uterus by repeated passage of the instrument and no irrigation of the uterus will be practised. A gauze drain may be placed in the uterus for twenty-four hours and the accident regarded with equanimity.

The serious perforations of the uterus are those inflicted by unpractised or unclean operators. They often occur in connection with attempts at criminal abortion. The perforation made by the curette is not recognized, and the instrument is repeatedly plunged through the wound, or a placental forceps may be opened and shut after it has been introduced into the abdominal cavity, seriously injuring the mesentery or the intestinal loops. The uterus may be irrigated with unclean or strongly germicidal solutions, which may gain access to the peritoneal cavity. The amount of traumatism that may be inflicted by the unskilled operator is appalling. The body of the uterus has been completely separated from the cervix, both uterine arteries divided, and the uterus left attached only by the tops of the broad ligaments. In one case the bladder was torn and several feet of intestine had been pulled through the cervix.

The **symptoms** of mutilation of the uterus of this type are those of shock and sepsis. Hemorrhage is usually profuse, and if the patient does react from the loss of blood, it is only to be stricken with the toxæmia of a peritonitis. The history of the injury may be difficult to elicit.

The **treatment** must be prompt and thorough. It is only in the early cases that a successful result can be achieved. If possible, the patient should be removed at once to a well-appointed hospital. The first indication is to combat the shock attending the injury and then to repair or remove the injured organ and provide suitable drainage.

If there is no reason to suppose that the intestine or the mesentery has been torn, and if the uterus is severely injured, it should be removed through a vaginal incision; otherwise an abdominal incision should be made, the intestinal tract carefully examined, and the injury repaired. In some cases extensive resection of the intestine has been required. Possibly no less favorable cases than many of these are encountered, and in spite of judicious and expert surgical treatment the patient may die of shock or sepsis.

Hæmatometra, Physometra, Pyometra.—When the cervical canal is imperforate congenitally or becomes obstructed, the secretions of the endometrium or the discharge from an intra-uterine disease cannot escape, so that the uterine cavity becomes gradually dilated to accommodate the pent-up secretion, menstrual or other, which slowly increases in amount until the condition known as *hæmatometra* results (Fig. 37). In congenital stenosis of the cervical canal this is one of the phenomena incident to that particular form of gynatresia.

Hæmatometra of non-congenital origin may be due to the accidental closure of the cervical canal by operations upon the cervix, or to the pressure of new growths that obstruct the cervix. The most common cause of an acquired hæmatometra is a carcinoma of the endometrium, affecting especially the region of the internal os. This condition is seen most frequently in old women, in whom previously there have probably been more or less atrophy of the cervix and contraction of the cervical canal. The infiltrated wall of the uterus becomes eroded, and the uterine cavity is increased in size by the breaking down of the carcinomatous areas and by the bleeding that takes place from the growth, until a tumor of considerable size may be formed. This is composed of the thinned-out uterine wall as a capsule, and its contents, carcinomatous debris and blood. If this carcinomatous tissue and blood become infected, pus formation ensues, so that the hæmatometra is converted into a *pyometra*. When degeneration progresses further and putrefaction occurs, gas is formed and is retained within the uterus, producing what is known as a *physometra*.

These conditions may be suspected in the presence of uterine enlargements in old women that are more or less fluctuant, and in which there is little or no discharge from the uterus. In cases of hæmatometra due to congenital stenosis the history is usually sufficient ground on which to base a tentative diagnosis. The most prominent symptoms are amenorrhœa, severe abdominal pain recurring at monthly intervals, and the gradual appearance of a pelvic tumor. In acquired cases cessation of the menstrual flow, periodic distress in the lower abdomen, and the appearance of a uterine enlargement are suggestive.

A symmetric enlargement of the uterus, which is fluctuant, in association with the symptoms mentioned, affords reliable evidence on which to base the diagnosis. A positive diagnosis can be made only by noting the obstruction to the passage of a sound into the uterus and the nature of the uterine contents.

The treatment of hæmatometra, physometra, and pyometra, due to carcinoma or other malignant diseases of the uterus, consists first in providing free drainage. When fever is present, and in all cases of pyometra and physometra, it is advisable to carry out this procedure as a preliminary operation, and subsequently, after the local infection has subsided and the patient is in better condition, to perform a radical hysterectomy, unless the disease is so far advanced as to make this impracticable.

In a majority of cases of pyometra or physometra the carcinomatous lesion has advanced beyond the hope of radical cure. The only procedure left for the surgeon is to make the patient as comfortable as possible, to

reduce septic symptoms by keeping the cervical canal patulous, and to prevent a reaccumulation of the fluid within. The remarkable results that have been achieved in late years by the use of radium (see Chapter XL) make this form of treatment a distinct and hopeful addition to the therapy of advanced carcinoma. When radium is used there should be no curettement of the uterus. When radium is not available then the necrotic masses may be scraped away and the cavity packed with formalin (10 per cent.) or acetone (c. p.) gauze.

Curettement.—By curettement of the uterus is meant a scraping away of the mucous membrane lining the uterine cavity. This is accomplished by means of an instrument known as the curette.

Before introducing the curette into the uterine cavity the size and position of the uterus should have been determined by making a bimanual examination. This should be confirmed by the passage of the uterine sound. After dilating the cervix, the curette is gently introduced into the uterus and passed on until it meets with the resistance of the fundus. The cutting surface of the instrument is then turned toward the posterior surface, and gently drawn forward toward the internal os in the median line. This procedure is repeated in various directions until the entire posterior surface has been gone over. The scraping is then continued upon the lateral borders of the endometrial cavity and then upon the anterior surface. Up to this point the ordinary Sims' curette should be employed (Fig. 290). After the anterior and posterior surfaces of the endometrial cavity have been scraped clean, so that the direct impingement of the edge of the curette on the uterine muscle can be felt and heard, another form of instrument, known as the Martin curette, is passed to the tubal angle on either side, and swept across to the opposite tubal angle, and the procedure repeated several times. The thoroughness of the scraping is important from the curative standpoint—the removal of every vestige of a diseased endometrium—and equally so from the diagnostic end, since all the endometrium must be removed and examined (the entire thickness of the endometrium cannot be removed, since the deeper parts are surrounded by the inner layers of the myometrium) in order to enable the surgeon to detect an incipient new growth which may occupy a small part of the endometrium and thus escape observation.

During curettement the operator will be able to detect inequalities of the endometrial cavity caused by fibroid tumors that encroach upon it, or even endometrial polyps that project from the surface of the mucosa. If, owing to inequalities detected by the curette or from the history and symptoms, the presence of polyps is suspected, it is well to use a small curettement forceps, opening and closing the instrument in the suspected area and removing particles of tissue thus secured. From the tissue removed during curettement the operator will often be able to determine correctly the nature of the endometrial lesion. In well-marked malignant disease, such as carcinoma or sarcoma, and in tuberculosis the particles removed will present a whitish, friable, cheese-like appearance, and the amount of curettings will be large. The endometrium may be markedly thickened, even in benign conditions, but the mucosa will come away in strips of considerable length, and when floated in salt solution the tissue will be pink and translucent.

Placental tissue comes away in fair-sized pieces; the tissue is infiltrated with blood-clot, and upon close inspection villi may be detected. In hydatidiform mole the small cyst-like bodies of the degenerated chorion may be identified (Fig. 298). Furthermore, the operator will usually be able to determine that this tissue lies in apposition with, but projects from, the uterine wall, whereas in malignant growths the tissue brought away is



FIG. 298.—Hydatidiform mole. (University Hospital.)

dug out from the uterine wall itself. These guides are trustworthy only to a limited extent and after some experience with them. In doubtful cases the diagnosis should be withheld until after microscopic examination. In those cases in which a clinical diagnosis is made and is taken as the basis for further immediate treatment, the clinical opinion should subsequently be verified by histologic examination. (See also Diagnostic Curettement and Test Excision, page 121.)

In order to prepare the curettings for microscopic sections, the entire quantity removed should be washed free of blood in salt solution and then placed in Zenker's fluid, in a 4 per cent. solution of formalin, or in 60 per cent. alcohol.

The remainder of the technic belongs in the field of the pathologist, but it is incumbent upon him to embed the entire amount of tissue and take sections from every part. Only in this way can error be prevented. If the uterus has been thoroughly scraped, it is unnecessary to use irrigation, and if bleeding does not occur, the introduction of a gauze pack is unnecessary. When the uterine cavity is enlarged, when hemorrhage is free, and particularly when placental or decidual tissue has been removed, a gauze pack for twenty-four hours is of considerable advantage.

BIBLIOGRAPHY

- ANSPACH, B. M.: "Metrorrhagia Myopathica." *Am. Jour. Obst.*, 1906, liii, 1; *Ibid.*: "The Frequency and the Significance of Endometritis from the Standpoint of Treatment." *Jour. Am. Med. Asso.*, 1908, 1, 842; *Ibid.*: "Hemorrhagic Uteri; Myopathic Uterine Hemorrhage." *Surg., Gynec. and Obst.*, 1908, ix, 315.
- BARROWS, C. C.: "Intramural Abscess of the Uterus." *Am. Jour. Obst.*, 1911, lxiii, 575.
- BROTHERS, A.: "Accidental Perforation of the Uterus." *Am. Gynec.*, 1903, ii, 323.
- FINDLEY, O.: "Arteriosclerosis of the Uterus as a Casual Factor in Uterine Hemorrhage." *Am. Jour. Obst.*, 1901, xliii.
- GARDNER, W., AND GOODALL, J. R.: "Chronic Metritis and Arteriosclerotic Uteri." *Brit. Med. Jour.*, 1906, iii, 1176.
- GELLHORN, G., AND EHRENFEST, H.: "Syphilis of the Internal Genital Organs in the Female." *Gyn. Trans.*, 1916, xli, 129.
- GOODALL, J. R.: "The Involution of the Puerperal Uterus, with Special Reference to the Involution of Its Circulatory System." *Am. Jour. Obst.*, 1909, lx, 921; *Ibid.*: "Climacteric Hemorrhage." *Am. Jour. Obst.*, 1910, lxi, 32.
- KAHLDEN, VON, C.: "Ueber die sogenannte Apoplexia Uteri." *Beiträge z. path. Anat.*, 1898, xxiii, 161.
- KAJI: "Zur Ovariellen Ätiologie uteriner Blutungen." *Monatschr. f. Geburtsch. u. Gynäk.*, 1910, xxxii, 427.
- MCILROY, A. L.: "The Significance of the Wassermann Reaction in Gynecological Diagnosis, with Special Reference to Uterine Hemorrhage." *Brit. Med. Jour.*, 1912, ii, 1002.
- PANKOW, O.: "Die Metropathia Hemorrhagica." *Ztschr. f. Geburtsch. u. Gynäk.*, 1909, lxv, 336.
- REINICKE, E. A.: "Die Sklerose der Uterinarterien und die klimakterischen Blutungen." *Arch. f. Gynäk.*, 1897, liii, 340.
- SHAW, J.: *Chronic Metritis; Its Pathology and Its Relation to Chronic Endometritis.* Sherratt and Hughes, London and Manchester, 1906.
- THEILHABER, A.: "Zur Lehre von der Entstehung der Uterusblutungen." *München med. Wchnschr.*, 1902, lxii, 1249; *Ibid.*: "Die sogenannte chronische Metritis, ihre Ursachen und ihre Symptome." *Arch. f. Gynäk.*, 1903, vii, 411.
- WHITEHOUSE, H. B.: "Hunterian Lecture on the Physiology and Pathology of Uterine Hemorrhage." *Lancet*, London, 1914, i, 877.
- WILLIAMS, P. F., AND KOLMER, J. A.: "The Wassermann Reaction in Gynecology." *Am. Jour. Obst.*, 1916, lxxiv, 638.

CHAPTER XVII

MYOMATA OF THE UTERUS

ETIOLOGY AND PATHOLOGY

THE etiology of myomata is obscure. That these tumors are at times congenital may be assumed from their presence between the horns of bicornate or double uteri. It is easily conceivable that fibroid rests in the urogenital strand might prevent the union of the Müllerian ducts. This evidence, however, is not convincing, since in a series of 1912 myomata operated on at the Königsburg Clinic, there were but two cases associated with maldevelopment of the uterus, and of twenty-four cases of poorly developed reproductive organs, myomata were observed in only two.

The etiology of myoma appearing after birth has been the subject of considerable speculation. The clinical fact that these tumors are frequently associated with sterility or nulliparity has given rise to the suggestion that the periodic recurrence of menstruation, without the physiologic rest obtained during pregnancy and lactation, may exert a causative influence. It is more reasonable to suppose, however, that the myomata themselves are the cause, rather than the result, of the sterility. In 1149 cases observed by Kelly and Cullen, more than 50 per cent were in women who had never been pregnant; 307 of the patients were single, and over 32 per cent. of the marriages had been sterile. Myomata are most common in middle life, being rarely observed before puberty or after the menopause. In a series of 100 consecutive cases, Hunner noted that 80 per cent. occurred between the thirtieth and the fortieth years. Laudau reports 42 cases occurring between twenty and thirty years—two were twenty years old.

Myomata seem to affect the colored more often than the white race. In Hunner's series there were 31 colored to 69 white women. In the general run of cases the ratio of the two races is as one is to five. In the autopsy records of the Johns Hopkins Hospital 33.7 per cent. of all negroes over twenty had uterine myomata, whereas 10 per cent. of all white women over twenty were afflicted with these growths.

Theilhaber believes that occasionally myomata are syphilitic in origin.

It is not definitely known in what tissues of the uterine wall they originate, but the blood-vessel walls are a suspected point, since the smallest seedling fibroids usually have a capillary in the center. Some authorities believe that myomata have their origin in the unstripped muscle-fibers of the myometrium.

Histology.—Myomata are made up of unstripped muscle and fibrous tissue in varying amount. The fibrous tissue is ordinarily somewhat in excess of the proportion found in the wall of the uterus, and for this reason the tumors are often spoken of as fibromyomata. They are also commonly called fibroids. On gross section they present a glistening white surface, the fibrous tissue being arranged in concentric layers or whorls; the entire tumor may consist of one large whorl or of a number of smaller ones bound together by interlacing bundles of fibrous tissue (Fig. 304). The

tumor is usually sharply differentiated from the surrounding uterine muscle to which it is rather loosely attached by a zone of reticulated vascular tissue from which the nutrient blood-vessels are derived.

Myomata, ordinarily, are not as well vascularized as the surrounding uterine muscle, the vessels which penetrate the tumor itself being small in

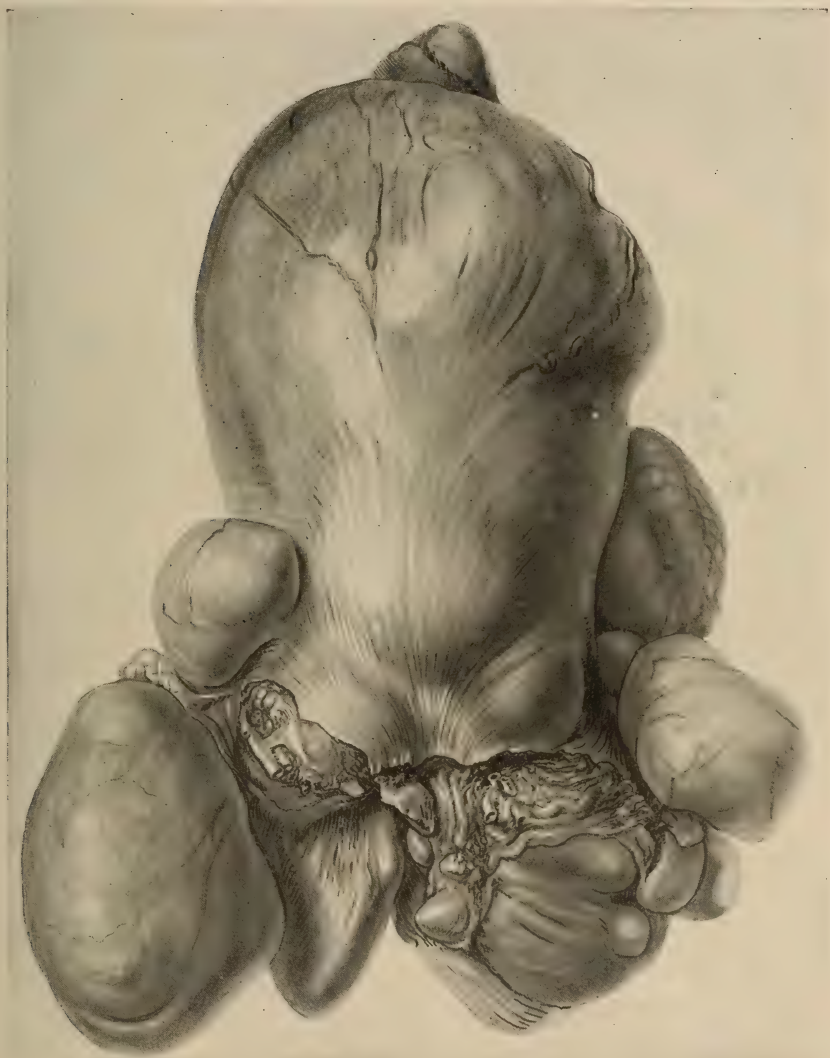


FIG. 299.—Multiple subserous myomata. (Gynecological Laboratory, U. of P.)

size and few in number. The surrounding uterine muscle may be very rich in blood-vessels, and sometimes the tumors themselves are well supplied, rarely even being angiomatous. The vessels in the capsule of the tumor are not infrequently enlarged, especially the veins, which present the appearance of wide venous sinuses such as are commonly observed in sub-

peritoneal tumors(Fig. 299). The tumors, as a rule, are but slightly attached to their capsule, and can be shelled out rather easily. Myomata are usually multiple, and vary in size from that of a pinhead to enormous masses which fill the pelvic or abdominal cavity. In shape they are generally spherical, but irregular in contour, and so many combinations may occur that, as a result, the myomatous uterus may be of almost any conceivable shape. The consistency of the growth varies considerably, depending upon the proportion of fibrous and muscular tissue which it contains. The consistency and resiliency also may be affected by the various forms of degeneration which these tumors may undergo.

Situation.—Myomata may occur in any part of the uterus, though they are more frequent in the fundus, and comparatively rare in the cervix. They very infrequently affect the vaginal cervix. Above the vagina the cervical



FIG. 300.—Schematic longitudinal sagittal section of uterus showing various positions of myomata. (a) intramural; (b) subperitoneal; (c) submucous; (d) cervical.

tissue was the originating point of the tumor in 6.6 per cent. of the cases collected by Frankl. Smead found cervical myomata in 5 per cent. of cases. They are usually multiple, from six to eight to as many as fifty tumors having been found in a single uterus. Fibroid tumors may be divided anatomically into three groups: First, interstitial; secondly, subperitoneal, and thirdly, submucous (Fig. 300). It is probable that the tumors all begin as *interstitial* growths, and that as they enlarge, they either remain at their point of origin, embedded in the muscle of the uterine wall, or migrate toward the serous surface and become *subperitoneal*, or toward the mucous surface and become *submucous*.

Subperitoneal and submucous tumors may be extruded almost entirely, maintaining their connection to the uterus by a drawn-out portion of the uterine muscle, in this event becoming pedunculated (Fig. 301). The pedicle may undergo stretching and torsion, so that, finally, the tumor is released from its uterine attachment and is either extruded through the cervix in case it is a submucous growth, or detached from the uterus if it is a subperitoneal one. In the latter instance, the surface of the tumor has already become adherent to the omentum from which it receives a sufficient blood supply and upon which it is parasitic. When a myoma develops at the side of the uterine body and grows between the layers of the broad ligament, it is spoken of as *intra-ligamentous* (Fig. 302). If a tumor grows from the posterior surface of the cervix and enlarges beneath the peritoneum of Douglas' cul-de-sac, it is termed *retroperitoneal*. A tumor growing from the anterior wall, between the bladder and the vagina, is called *subvesical*.

Growth.—The growth of myomata is usually slow. They may increase rapidly during pregnancy, or as the result of degeneration (cystic or sarcomatous) or suppuration. During involution following labor they diminish in size, and have been said in some instances to disappear. After the menopause, small tumors may stop growing, or even atrophy, but a great many of them show little tendency to do either, and in the latter event postpone indefinitely the cessation of menstrual life. On the contrary, there is great likelihood, at the time of the menopause, that myomata may undergo degeneration or become complicated by malignant disease of the uterus.

Uterine Changes.—The myomatous uterus is usually considerably hypertrophied, and the endometrial cavity elongated and distorted. The hypertrophy of the muscular wall of the uterus is greatest in the presence of interstitial tumors, and least where the growth is subperitoneal.



FIG. 301.—Uterus opened, showing pedunculated submucous myoma. (Gynecological laboratory, U. of P.)

While the endometrium may be normal, it is very often affected by the pressure and circulatory disturbance produced by the tumor. Pressure causes overstretching, thinning and atrophy; circulatory disturbance produces œdema and hypertrophy. The apparent erosion and atrophy of the endometrium in submucous or interstitial centripetally developing myoma is in reality great attenuation and stretching of the endometrium. The stroma is very much thinned out and the few remaining glands lie parallel to the free surface of the tumor. In some cases the glands may entirely disappear. The blood-vessels of the endometrium may be dilated and appear sinus-like. Usually they are displaced towards the periphery, where they present a concentric arrangement. Actual erosion is rare except where a submucous tumor is being extruded from the uterine cavity. There may be localized hypertrophies or polyps of the endometrium. Malignant affections are not unusual, as will be considered later.

Complications.—The complications which may be associated with myomata are many. The uterine appendages not infrequently are adherent, and may be the site of hydrosalpinx and of cystic degeneration of the ovaries. Sometimes the myoma is complicated by an acute and active infection of the tubes and ovaries (Fig. 303). The tubes are frequently involved. In a series of 1149 myomata reported by Kelly and Cullen, nearly one-half showed one or both tubes adherent. In this series hydrosalpinx (88) was the most frequent tubal lesion; chronic sal-

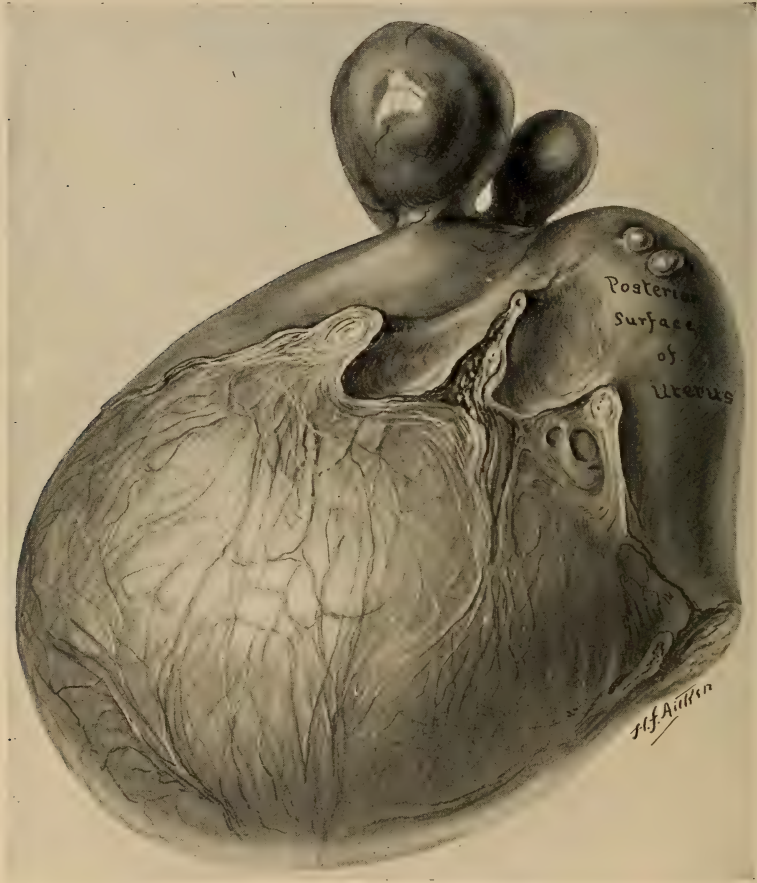


FIG. 302.—Intraligamentous fibroid. (University Hospital.)

pingitis (48) and pyosalpinx (41) came next; tuberculosis (14), hæmatosalpinx (12), tubo-ovarian abscess (14), cyst (2), and tubal pregnancy (6), were present. The ovaries showed pathologic changes as often as the tubes in this series, being adherent or showing some pathologic lesion in more than half the cases. Aside from adhesions, Graafian follicle cysts (68) and corpus luteum cysts (34) were the most frequent ovarian lesions—but dermoid cysts (17), papillomatous cystomata (12), multilocular adenomystoma (9), and adeno-carcinoma (8) were present. The ovaries were not infrequently hyper-

trophied or oedematous, and actual fibromata (3) were found. Parovarian cyst was noted by Kelly and Cullen in 19 cases of this series.

Degenerations.—The myomata themselves may undergo various forms of degeneration. In nearly every tumor in this series of Kelly and Cullen there were microscopic areas of hyaline degeneration. In many of these (114) the hyaline changes could be recognized macroscopically. When hyaline transformation is marked, liquefaction of the degenerated areas may



FIG. 303.—Myomatous uterus complicated by inflammatory lesions of the adnexa; pyosalpinx and advanced peri-oöphoritis. (Gynecological Laboratory, U. of P.)

occur with the formation of smaller or larger collections of fluid (cystic degeneration) (Fig. 304). Circulatory obstruction may produce oedema; this usually occurs in association with hyaline degeneration. Calcareous infiltration of a fibroid tumor is occasionally observed. This varies in degree from single to multiple "gritty" areas scattered throughout the myomatous tissue. Complete calcification is rare. Suppuration of myomata with the formation of abscess may occur, the infection reaching the previously degenerated (hyaline) tumor from the neighboring bowel in the case of sub-



FIG. 304.—Interstitial myoma undergoing necrosis and cyst formation. (Stetson Hospital.)

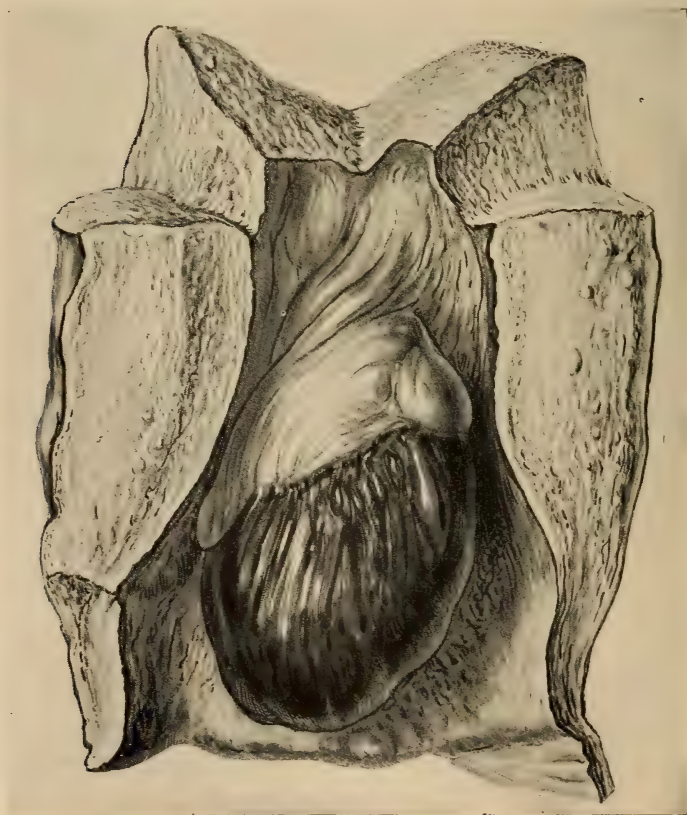


FIG. 305.—Necrosis of submucous myoma. (Gynecological Laboratory, U. of P.)

peritoneal tumors, and from the uterine cavity in the case of interstitial growths. Necrosis is the result of total, or nearly total, interference with the blood supply of a tumor. It is most common in pedunculated submucous tumors (Figs. 305 and 306). A myoma may be so richly supplied with blood-vessels as to form an angioma. This is a rare occurrence. The lymphatic vessels upon the surface of a myomatous uterus, or even within the fibers of the tumor, are sometimes enormously dilated. Very rarely the myomatous tissue may be transformed into fat (lipomyoma). All benign forms of degeneration of myomata are more or less the result of an inter-



FIG. 306.—Necrotic submucous myoma projecting from cervix through vulvar orifice. (University Hospital.)

ference with the blood supply. They may also result from traumatism or torsion if the tumor is pedunculated.

A myoma may become directly transformed into a sarcoma (myosarcoma). The frequency with which this is reported to occur depends upon the thoroughness with which all myomata are routinely examined. Winter found sarcomatous transformation in 4 per cent. of all cases. In the submucous variety of myoma, 9 per cent. showed the sarcomatous changes. Frankl has found sarcomatous change in 2.3 per cent. of 514 personally studied myomata.

A myoma cannot degenerate or be transformed into a carcinoma, but car-

cinoma of the endometrium or cervix may complicate myoma. Myomata of the uterus seem to predispose to the development of carcinoma of the endometrium. This is indicated by the fact that in myomatous uteri corpus carcinoma is relatively much more frequent than cervical carcinoma; whereas the usual ratio of cervical to fundus carcinomata is as 15 is to 1, in the fibroid uterus the ratio is as 0.62 is to 1 (Winter). In a series of nearly 5000 cases of myomata uteri (Kelly-Noble), carcinoma of the cervix was

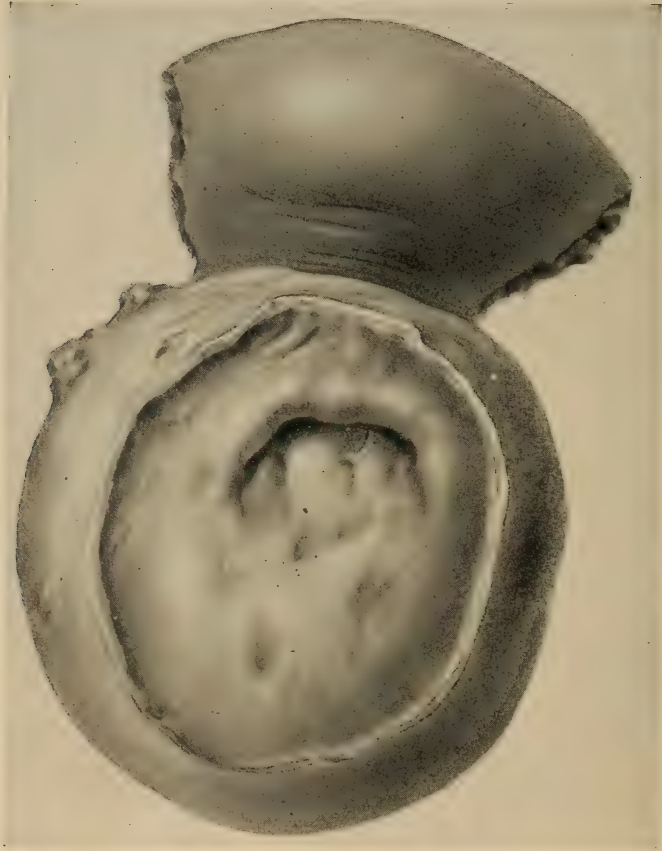


FIG. 307.—Cervical myoma. (Bryn Mawr Hospital.)

present in $1\frac{1}{4}$ per cent.; carcinoma of the body of the uterus (Fig. 307) in $1\frac{1}{2}$ per cent.

Pressure Effects.—The effect of myomata upon surrounding organs is due almost entirely to the mechanical displacement and distortion which these tumors produce. When a tumor is situated so that as it increases in size it is held within the pelvis, as is true of intraligamentous and cervical growths, it compresses the pelvic structures against the unyielding bony pelvis (Fig. 308). In this way pressure is brought to bear upon the bladder, urethra, ureters, and rectum. The bladder may be either pressed upon or

displaced. In tumors originating from the anterior surface of the uterus below the vesical reflection of the peritoneum, it is not uncommon to have the bladder pushed upwards above the symphysis (Fig. 309). Tumors originating in other areas, when large and tightly impacted, may displace the bladder almost entirely out of the pelvis, or may compress certain areas of the bladder, leading to partial obstruction of the urinary outflow and sacculatation. There may also be adhesions between the superior movable surface of

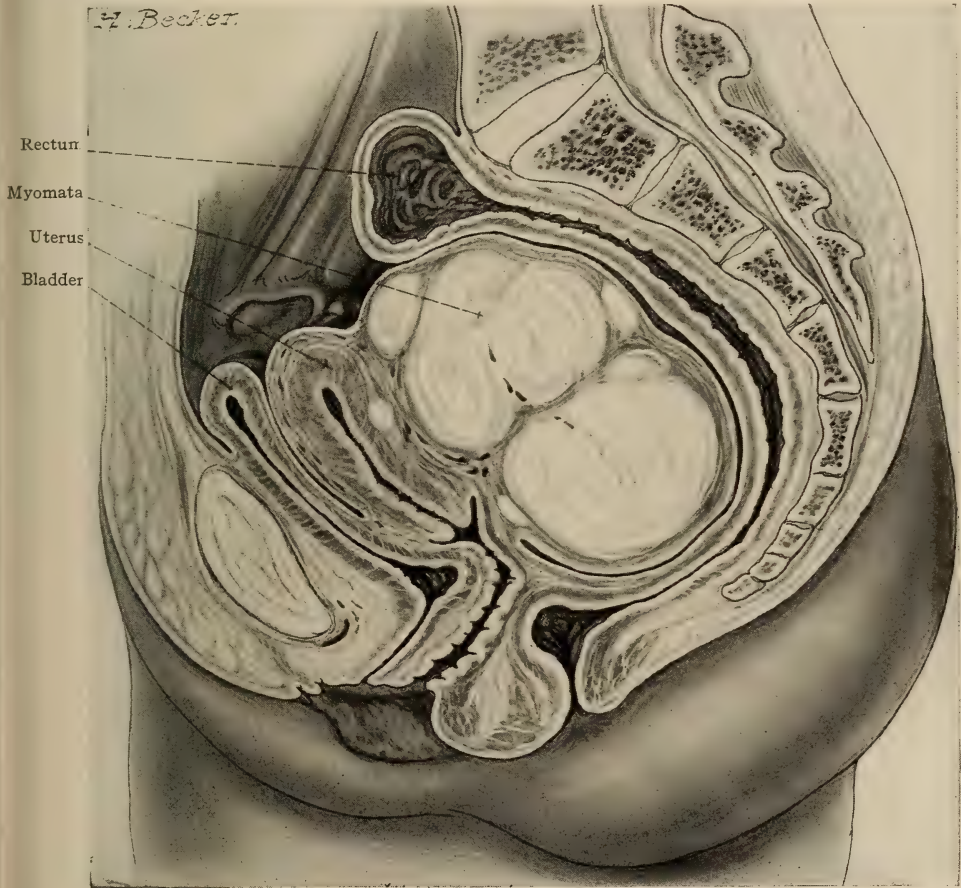


FIG. 308.—Multiple myomata of the posterior uterine wall, incarcerated in pelvis, causing pressure symptoms, and simulating pregnancy in a retroflexed uterus.

the bladder and the anterior surface of the myomatous uterus. In rare instances the myoma may be so situated as to displace the bladder downwards, exaggerating in one case coming under the writer's observation, a previously existing cystocele. As a result of interference with its normal function, the bladder wall may be hypertrophied, there may be distention and sacculatation with retention of urine, and a low-grade cystitis. Vesical calculus has been noted in association with myomata.

The ureters may be displaced or compressed. They are affected, as a

rule, only by intraligamentous or subvesical tumors. Growths originating in those localities may elevate the ureters so that they course over the lateral surface of the fibroid, or they may be compressed between it and the bony pelvis. The ureter above the point of compression may become very much dilated (hydro-ureter). Thus the kidneys may become secondarily the seat of hydronephrosis. The changes in both ureters and kidneys at first are purely mechanical, and if the myoma is removed in time they disappear.

There may be adhesions between the rectum and the fibroid uterus; especially is this likely to occur when other pelvic inflammatory lesions coexist. The sigmoid may be elevated by a tumor which grows posteriorly beneath

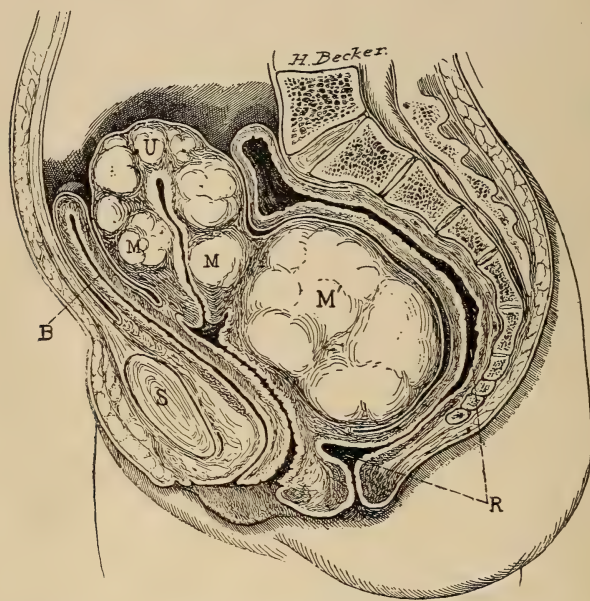


FIG. 300.—Incarcerated subserous myoma causing intra-pelvic pressure: (B) bladder pushed up and pressed against pubic bone and anterior abdominal wall; (U) uterus with multiple interstitial myomata; (M) myomata; (M') subperitoneal myoma filling pelvic cavity, pushing up uterus; (R) rectum; (S) symphysis pubis.

the peritoneum and between the layers of the meso-sigmoid. The compression of the rectum may be sufficient to cause partial obstruction, resulting in chronic constipation, with atony and distention of the large bowel followed by autointoxication and anæmia from the absorption of toxins. Absolute obstruction from compression of the rectum probably never takes place, although it is marvellous that it does not occur in those cases in which the tumor completely fills and is tightly wedged in the pelvis.

Pressure on the nerve trunks passing through the pelvis may produce pain at nearby or remote points. Compression of the veins may cause venous dilatation and œdema of the lower extremities. Pressure on the large arteries at the pelvic brim may cause a bruit.

Circulatory Lesions.—It has long been noted that myoma patients fre-

quently (nearly 50 per cent. of the cases in Boldt's series) suffer from *cardiac palpitation* and *dyspnœa*, and exhibit *murmurs* and an *increase or irregularity in pulse-rate*. After operation thrombosis and embolism are more frequent in this than in any other class of cases. For these reasons myomata have been supposed to exert some peculiar specific effect upon the heart which produces a degeneration of the cardiac muscle. The mechanical resistance of the fibroid to the pumping of blood through its capsule, or the pressure exerted by the tumor upon the pelvic or abdominal vessels, has been alleged to be the cause of cardiac dilatation and insufficiency. Syphilis has been stated to be a cause of both myoma and heart disease. The cardiac condition has been considered primary and the myoma secondary. A pathologic state of the ovary whereby it manufactures a noxious toxin has also been assigned as an explanation. When the facts are analyzed, we find that twenty-six cases of myoma uteri have been autopsied and recorded in which brown atrophy, fatty degeneration, and myofibrosis were found. Winter, analyzing these cases, concluded that there were but five in which no other cause but the myoma could explain the lesion. In 266 cases of myoma uteri of his own, which were carefully examined by an internist and then followed after operation, the heart was normal in 60 per cent.; in 30 per cent. there were murmurs or impure tones; in 6 per cent. there was dilatation and hypertrophy without valvular or myocardial disease; in 1 per cent. there were valvular lesions, and in 1 per cent. myocardial lesions. All of these cases were reëxamined after operation by the same internist as before, and followed up sufficiently to determine positively the condition of the heart after the benefit of the operation had made itself apparent. All of the valvular and myocardial lesions remained the same, while a large majority of the hypertrophies and dilatations disappeared. Almost all of the murmurs or impure tones cleared up. As a result of this careful investigation Winter concludes that myomata influence the heart only by reason of the anæmia which they so commonly produce. The experience of Kelly and Cullen is in accord with this finding of Winter's, and in their series but two cases of myocarditis were noted.

It can not be denied that in myoma advanced degeneration, as well as infection and necrosis, may produce toxins which cause changes in the cardiac muscle. Myoma patients in or beyond middle life commonly exhibit arteriosclerosis. The latter is not to be looked upon as a result of the myoma, but rather as an associated lesion. According to Theilhaber, the production of the myoma is the result of the arteriosclerotic tendency. The veins of the pelvis and lower extremities in myoma cases are not infrequently enormously enlarged and dilated as the result of pressure and interference with the return of the venous blood to the heart. This dilatation of the veins, plus the impaired force of the circulation, plus the anæmia favors thrombosis and embolism.

Anæmia is a common finding in patients suffering from myoma. This, as a rule, results directly from the profuse menstrual or intermenstrual flow. In more than half of the cases, according to Hunner, two-thirds according to Winter, at the time the patient comes under observation there is menorrhagia or metrorrhagia. In the worst cases with a very low hæmo-

globin percentage, the bleeding usually has been a very pronounced and recent feature; so that there is a very apparent connection between impoverishment of the blood and the amount lost. In a certain number of cases, however, the degree of anæmia seems excessive in comparison to the amount of blood lost. In such cases the production of specific toxins by the tumor has been suspected. Degenerative changes, necrosis, infection, and suppuration of the tumor itself often explain the condition, and careful inquiry will usually elicit the fact that bleeding in the past has been profuse or that there are other causes for the blood abnormality, such as constipation with absorption and toxæmia, kidney disease, or some other concomitant lesion.

SYMPTOMS

Menorrhagia and Metrorrhagia.—The most frequent symptom of myomata of the uterus is profuse menstruation (menorrhagia). In certain cases, as will be noted later, there may be intermenstrual bleeding. When the myoma is interstitial, the menorrhagia is the result of an increase in the amount of blood pumped into the endometrium (menstrual congestion) and the interference with the return flow through the veins due to the pressure of the tumor. As the growth increases the menstrual hemorrhages increase. If the location of the tumor changes, *i.e.*, if it migrates towards the peritoneal surface, the interference with the endometrial circulation is less and the menstrual flow may notably diminish or become normal. If, on the other hand, migration occurs toward the endometrial cavity, the menstrual hemorrhage increases, because the interference with the endometrial circulation is greater. Besides the increase in the amount of the menstrual flow, the periods are usually prolonged and occur more frequently than they would normally. Thus a woman who has been in the habit of menstruating every month finds her periods recurring every three or every two weeks.

The menstrual blood is the result of a diapedesis through the walls of the endometrial capillaries, so that the hemorrhage, up to a certain point, may be simply an increased diapedesis due to venous obstruction. If, however, the tumor becomes submucous, there may be in extreme cases an actual erosion of the endometrium covering the growth; more commonly the capillaries in the thinned-out mucosa rupture, under the influence of the menstrual congestion, so that, in addition to the hemorrhage at the time of menstruation, there are intermenstrual hemorrhages (metrorrhagia).

When intermenstrual bleeding supervenes upon increased frequency of the menses and menorrhagia the loss of blood may be nearly constant. Except in the worst cases the menses may be recognized by an increase in the amount of the hemorrhage at periodic intervals.

In the individual patient afflicted with myomata more than one or all of the anatomic varieties of tumor may be combined, so that the mechanics of the hemorrhage which have been given here are not always typically illustrated. Submucous growths or myomata which distort the endometrial cavity are almost invariably present when the menstrual hemorrhage is marked. A single submucous myoma, the size of a pea, may occasion more alarming hemorrhage than tumors of an interstitial or a subperitoneal type of a much greater size.

Leucorrhœa.—Leucorrhœa may be noted during the menstrual interval. This may be mucus when the endometrium is hypertrophied, pus if there is infection of the cervix or endometrium, watery and foul-smelling if there is beginning necrosis of a submucous tumor, or putrid and purulent in the presence of a necrotic and infected submucous growth. The discharge, whatever its usual character, may be streaked with blood before and after the menstrual period.

Pain.—Pain of some sort is present in over half of the cases observed by the clinician. It may be independent of the menstrual periods or limited to such times. The pain which is independent of the menses is usually due to the pressure of the myomatous uterus upon the surrounding parts.

Subperitoneal myomata of moderate size, springing from the fundus of the uterus, rising free into the abdominal cavity, and uncomplicated by adhesions, give rise to no pain. After tumors attain a certain size and distend the abdomen, a feeling of fullness and distress, difficulty in breathing, etc., may be experienced. Intestinal or omental adhesions or neighboring inflammatory processes (appendix, adnexa, etc.) may give rise to pain in connection with tumors of this type.

Myomata springing from the body of the uterus or the cervix produce the greatest *pressure pain*; this is true especially of those tumors which grow between the layers of the broad ligament (intraligamentous) or distort and displace the bladder or the ureters. A myomatous uterus impacted in the pelvis may cause severe bladder or rectal symptoms or referred pain to nearby or distant parts (Figs. 308 and 309). Submucous tumors may give rise to painful uterine contractions. Acute agonizing pain may be occasioned by the torsion of a pedunculated fibroid tumor. Adherent, inflamed, or suppurating myomata may occasion pain. As is to be expected, myomata accompanied by adnexal lesions (salpingitis, oöphoritis, pyosalpinx, ovarian abscess, etc.) are associated with more pain than uncomplicated cases.

Frequent and painful urination is not an uncommon symptom and has been noted in nearly 25 per cent. of some series of consecutive cases of myomata. It varies in degree, depending upon the situation of the tumor and the associated changes that have been produced in the urinary system. There may be no discomfort except a frequent desire to empty the bladder as a result of the infringement of the tumor and a lessening of the bladder capacity, or the growth may be so placed that a complete emptying of the bladder is impossible, and there is constantly a certain amount of residual urine with ammoniacal decomposition, or there may be actual partial obstruction to the outflow of urine, with consequent sacculation of the bladder and decomposition of the retained urine. In one case the urinary symptoms were typical of vesical stone, there being sudden stoppage of the stream, intense pain, and hæmaturia.

Pressure upon the ureters may lead to obstruction of the ureteral output with *renal crises*. This in one patient was the first symptom which led to the discovery of a large fibroid tumor. Painful defecation is not uncommon when the tumor presses upon the rectum or there are hemorrhoids, and is very often accompanied by constipation and a feeling as if there were a foreign body in the rectum.

Pain due to pressure on the pelvic nerves may be referred to the back, hips, or legs; *numbness* or loss of sensation in one or both legs is present in rare instances. The pain produced by myomata is usually increased just before and at the beginning of the menstrual periods, when the congestion of the pelvic organs is greater; after the flow is well established there may be a subsidence of the pain to about its usual degree of severity, or even less, if the congestion has been much relieved by the hemorrhage. In the presence of submucous or interstitial growths there may be *cramp-like pains* throughout the flow.

Circulatory Symptoms.—Myoma patients frequently (50 per cent.) exhibit an increase in the pulse-rate, palpitation, and dyspnœa. In such cases there are usually murmurs, systolic in time, heard best at the apex and transmitted to the axilla or pulmonary and aortic areas. There are many variations in these murmurs. They are, as a rule, the result of anæmia, deficient blood supply to the coronary arteries, and subsequent cardiac dilatation. In rare instances brown atrophy or fatty degeneration has been present; myocarditis or endocarditis may coexist with myoma without there being any relation between them. The heart murmurs and the cardiac symptoms so frequently observed in myoma cases usually disappear rapidly after removal of the myoma and cessation of the hemorrhage. The clinical evidences of anæmia and cardiac insufficiency are pallor, palpitation, dyspnœa, chronic cough, and œdema of the lower extremities. The latter may also result from pressure of the tumor upon the pelvic veins, or it may be due to weakness of the heart or to renal insufficiency—sometimes to all of them combined. When the œdema is due to pressure alone it may be either unilateral or bilateral. Œdema produced by anæmia or by kidney insufficiency is bilateral.

Anæmia.—The production of anæmia in fibroid tumor has already been explained (page 303). It is usually proportionate to the amount of hemorrhage, and the very marked degrees are almost never seen except in those patients who at the time of observation have considerable menorrhagia or metrorrhagia. Occasionally the anæmia, although not excessive, seems out of proportion to the bleeding. We must assume in such cases that at some time in the past the hemorrhage has been more profuse and that an anæmia produced at that time has persisted—the associated conditions preventing, or rendering slow and difficult, a return of the blood to a normal state. In still other cases the anæmia may be associated with toxæmia from chronic constipation, kidney insufficiency, necrotic or infected tumors, etc. In the worst cases the hæmoglobin may fall as low as 10 per cent., though it very rarely reaches this low point. Thirty to 40 per cent., however, is not uncommon. As a rule, the hæmoglobin reading is between 60 and 70 per cent. The erythrocytes are usually diminished in proportion to the decrease in hæmoglobin.

DIAGNOSIS

The ease with which a diagnosis can be made depends upon the number, size, and location of the tumors. Subperitoneal growths give the most characteristic physical signs. Interstitial and submucous tumors may present more difficulties. Large tumors are usually diagnosed more readily than

small ones; a multiplicity of nodules in the uterus is a valuable diagnostic point (see also Chapter VIII).

Abdominal Examination.—When the myomatous uterus is large enough to form an abdominal tumor the appearance of the enlargement is often more or less characteristic. As a rule, the enlargement is asymmetrical; the tumor is more prominent on one side of the median line than on the other, and the abdominal wall curves abruptly from the summit of the tumor in both directions, *viz.*, toward the symphysis and toward the epigastrium. The abdomen portrays the actual condition, *i.e.*, a hard, resisting body within the abdominal cavity, pushing the abdominal wall forward. By palpation the observations made on inspection are confirmed and the consistency of the tumor is noted (Figs. 133 and 134). A myoma usually gives a distinct sense of hardness and denseness, which readily distinguishes it from a pregnant uterus or an ovarian cyst. The surface of the growth may be knobby, and there may be smaller tumors on the surface of larger ones. If it can be determined by palpation that these smaller tumors are pedunculated, the diagnosis is all but positive. Percussion of a myoma distending the abdomen gives dulness over the prominence of the tumor and resonance surrounding it, except toward the pelvic brim. There are no auscultatory indications of a myoma. A bruit is heard in exceptional cases when the tumor overlies and presses upon some of the large veins at the pelvic brim. If the fibroid is intramural and distends the uterus symmetrically, it may be impossible to distinguish it from early pregnancy. In such cases it is advisable to keep the patient under observation until foetal movements and foetal heart sounds will be manifest if the woman is pregnant. It should be remembered, also, that pregnancy and myoma may coexist.

Bimanual Palpation.—*Submucous tumors:* The uterus is enlarged and more or less symmetrical. It is harder than the pregnant uterus. If the tumor is pedunculated, it sometimes dilates the cervix and presents itself in the cervical canal, or it may be extruded from the canal and hang by its pedicle in the vagina. In the case of small submucous tumors, a positive diagnosis can be made only after dilatation of the cervix and intra-uterine exploration by means of the finger, sound, or curette. *Interstitial tumors:* The cervix fuses directly with the enlarged fundus. It sometimes projects from the surface of the latter like a nipple from the breast. The uterus is usually somewhat irregular and of increased density. The uterine body cannot be outlined distinctly from the mass. This form of tumor is most difficult to distinguish from pregnancy. *Subperitoneal tumors:* The uterus is studded with hard, knob-like protuberances. If they are pedunculated, the diagnosis is clear. When the growths are confined to one side of the uterus or to the fundus, the uterus can be outlined as a distinct but attached body. When the tumor is single and pedunculated, an ovarian growth must be excluded; an attempt should be made to isolate the ovary upon the affected side. If a subperitoneal myoma which rises out of the pelvis and distends the abdomen is pushed upward by the external hand, the uterus will immediately follow. If the tumor is held in that position and the uterus is drawn downward, the pedicle of the tumor may be felt at its attachment to the uterus by rectal palpation.

Myoma of the uterus must be distinguished from solid and cystic tumors of the ovary. Normal pregnancy, ectopic pregnancy, pelvic inflammatory masses, and carcinoma of the uterus or of the ovary may also simulate myoma. The distinguishing features between myoma of the uterus and ovarian cyst are as follows: The abdominal distention and projection in a myoma are more abrupt and irregular than in the case of an ovarian cyst. The abdominal enlargement in myoma is apt to be asymmetrical, whereas with an ovarian cyst of sufficient size to cause abdominal distention, the enlargement is more apt to be equal to the right and left of the median line. The surface of the tumor is often more uneven in myoma than in ovarian



FIG. 310.—Myoma uteri and pregnancy (University Hospital).

cyst, and on palpation of a denser consistency. On percussion ovarian cysts give fluctuation, while myomata do not. The percussion wave in an ovarian cyst may be indistinct when the tumor is multilocular, and all the loculi are small and filled with gelatinous substance. Sometimes a myoma has undergone cystic degeneration, and then it may show a wave of fluctuation, although this is a very exceptional occurrence. In myoma there is dulness over the greater prominence of the growth and resonance surrounding it, but the area of dulness is neither as symmetrical nor as absolute as in the ovarian cyst which is apt to hug the anterior abdominal wall more closely than an irregular myoma.

On bimanual palpation in a case of myoma it can be determined that the abdominal mass is in direct connection with the uterus. It is sometimes

possible to distinguish between a myoma of the uterus and an ovarian cyst by picking up the ovaries on either side by bimanual palpation. Although it is not always possible to do this, in every doubtful case an effort should be made to find the ovaries, and especially the ovary on the suspected side. In some cases of ovarian cyst it is possible to outline the uterus lying either in front of or behind the cystic mass. In other cases the abdomen as well as the pelvis may be so distended that bimanual examination is unsatisfactory. In such cases occasionally a distinct wave of fluctuation may be felt through the vaginal wall upon tapping the abdominal surface.

The chief difficulty in differentiating myomata from ovarian cysts will be found in those of moderate size. An ovarian cyst which is not adherent can be pushed away from the uterus without causing as direct a tug upon that organ as would be occasioned by pushing up a myoma. Likewise, in ovarian cyst an impulse transmitted to the growth above the pelvic brim is not felt so distinctly at the cervix. When the ovarian cyst is intraligamentous in type, or adherent, the distinguishing features between it and a fibroid tumor are the consistency of the enlargement, the presence of fluctuation, and the associated physical findings, such as the presence of other fibroid nodules in the uterus and the size of the uterus itself.

The differential diagnosis between myoma and pregnancy is frequently very difficult, especially if the tumor is of the intramural or interstitial type (Fig. 310). The enlargement of a pregnant uterus in a great majority of instances is more symmetrical than that of a myomatous one, but there are some myoma cases in which it requires considerable study to make a diagnosis. In order to differentiate between the two conditions the history and the associated signs of pregnancy must be relied upon. The softening of the lower uterine segment (Hegar's sign), foetal movements, foetal heart sounds, and ballottement should be looked for. In case of doubt, the solution of the question is found after observing the case for a couple of months. At the end of this period, with no appearance of the signs characteristic of pregnancy, the diagnosis, as a rule, will be unmistakable. There have been instances where an abdominal pregnancy which had undergone lithopedion formation has been mistaken for a myoma, and the shape of some large subperitoneal tumors has at times suggested the outlines of a foetus in utero. The differential diagnosis may be facilitated by a röntgenogram. After the sixth month the Röntgen ray is useful in the differential diagnosis of pregnancy as the shadow of the foetal skeleton may then be recognized in a well-executed negative. There is apparently no tendency to abortion or miscarriage from the use of this means of diagnosis. The Abderhalden serum reaction may be tried, but is not likely to be of value. In some cases anæsthesia may be required before a satisfactory diagnosis can be made.

The diagnosis between myoma and pelvic inflammatory masses, as a rule, is not difficult, but occasionally some doubt may arise. An abscess surrounded by a considerable amount of exudate and induration may exactly simulate a myoma. Usually, however, the induration, the sense of deep fluctuation, and the associated history and signs of inflammatory pelvic trouble serve to distinguish between them.

TREATMENT

From what has been said, it can be seen that myomata, although not essentially malignant, are capable of much mischief, and after a certain time may become very dangerous to their host. A small tumor of an interstitial or a subperitoneal type, developing late in life, showing no tendency to grow with any degree of rapidity, giving rise to no symptoms, and possibly discovered by accident during pelvic examination, may be regarded with equanimity and let alone. Such a patient should always be carefully watched, and from time to time examined, so that an increase in the rapidity of growth or any complications may be detected at once.

If any rule were to be made in the treatment of myomata producing symptoms it should be to remove them by a surgical operation within a short time after they had been detected. This would be justified by the fact that most of the myomata producing symptoms ultimately require operative treatment, and many times when operation is delayed the case becomes complicated and dangerous or even fatal degenerations and complications ensue, or the operation is rendered more difficult by an increase in the size of the tumor.

Palliative treatment, therefore, is only considered because sometimes, on account of the condition of the woman as a result of the hemorrhage and other effects of the tumor or because of advanced age and general ill-health, it may be inadvisable to operate at all, or, at any rate, to proceed with an operation until the strength and resistance of the patient have been increased by suitable preparatory treatment. The control of hemorrhage is the most immediate and pressing indication in a majority of the cases in which anæmia is marked and the circulatory condition of the patient is bad. Absolute rest in bed during the menses, or whenever hemorrhage is apt to occur, and the use of remedies which arrest hemorrhage by contracting the uterus or by increasing the coagulability of the blood will often be effectual. Ergot, pituitary extract, stypticin, and horse-serum may be tried for this purpose. If more heroic measures are necessary a gauze tamponade of the cervix may be tried with full aseptic precautions. Curettement is not advisable for the purpose of controlling hemorrhage because it may hasten the necrosis of a submucous tumor by interfering with the blood supply, and by favoring entrance of pathogenic organisms. The Röntgen ray and radium are valuable therapeutic agents; either will check the bleeding in a majority of cases so that the patient may be put in good shape for a subsequent radical operation. At the present time the weight of evidence is against the use of the Röntgen ray or radium as curative agents in cases of myoma uteri, except under certain conditions (see Radium and Röntgen Ray Therapy, Chapter XL).

With the measures to prevent further hemorrhage must be combined those which promote the restoration of the blood and circulatory system to a normal condition. Iron and arsenic, blood transfusion, cardiac and renal stimulants, all may be required.

The indication for operation is all the more urgent when the myoma is

growing rapidly, when the woman is approaching the menopause, or a recent irregularity in the hemorrhage suggests the probability of a complicating malignant growth of the endometrium.

Choice of Operation.—The operative treatment of myoma uteri varies from the simplest to the most formidable undertaking. **Myomectomy** is the removal of the tumor from the uterus, the latter being left *in situ*. **Hysteromyomectomy** is the removal of the uterus with the tumor. Either of these operations may be undertaken through an abdominal incision. The operation selected in a case of myoma depends upon the number and location of the tumors, and the desirability in the individual case of preserving the menstrual and the reproductive functions. A single tumor attached to the vaginal part of the cervix may be subjected to vaginal myomectomy. Kelly and Cullen report eighty-four cases of vaginal myomectomy with five deaths; with one exception the patients who died were septic or in a desperate state when admitted, owing to infection, necrosis, or gangrene of the tumor.

A submucous tumor which has become pedunculated and projects through the cervical canal can be removed by torsion or by ligation and division of the pedicle. A submucous tumor lying within the cervix or the lower uterine segment may be enucleated (vaginal myomectomy) after bisecting the anterior uterine wall to secure adequate exposure. Multiple submucous tumors or single ones not easily accessible demand hysteromyomectomy. Hysteromyomectomy for cervical myomata by the vaginal route is feasible when the myomatous uterus is small, but the abdominal route possesses so many advantages that it is generally recognized as the procedure of choice. In the operative treatment of myomata affecting the body of the uterus the abdominal operation is the only one which need be taken into consideration. The choice between myomectomy and hysteromyomectomy depends upon the factors already mentioned. The more numerous the tumors, the more is hysteromyomectomy indicated, and the greater the distortion of the uterine body the less likely is myomectomy to be satisfactory. Degeneration of the myoma and suppurative or malignant complications are absolute contraindications to myomectomy. The cases most suited to myomectomy are those in which the number of tumors is small; single tumors or at most not more than four or five; the tumors are favorably situated, especially subperitoneal or interstitial, so that they can be removed without serious technical difficulties and without encroaching upon the uterine cavity; the cases give no evidence of degenerative changes; there are no malignant complications; there is no associated suppurative disease of the adnexa, and there is not so much distortion of the uterus by the tumor that after myomectomy it would be a misshapen and useless organ.

The age of the patient and her desire to bear children is another important factor in reaching a decision. While there is no reason to be conservative in a patient nearing the menopause who would be unlikely to conceive or in one who had no desire to bear children, the probability of gratifying the maternal instinct should be preserved whenever possible in younger women. In this class conservative myomectomy may yield the most happy results.

Objections to myomectomy are: That occasionally it is a more serious

and a more dangerous operation than hysteromyomectomy; that it must be done with the most refined aseptic technic in order to avoid infection and dangerous post-operative adhesions; that it may be necessary subsequently to operate again to remove the uterus on account of the development of other myomata which escape detection at the time of the first operation, and that pregnancy, after myomectomy, may end in abortion, or that labor may be complicated by a rupture of the uterus.

With the progressive refinement in operative technic, and a careful limitation to suitable cases, myomectomy has become a safe operative procedure (Mayo, Wm. J., 157 consecutive cases with one death; Kelly and Cullen report a mortality of 5.4 per cent. in 296 abdominal myomectomies), the primary mortality being less than that of hysteromyomectomy when the cases are properly selected. Hysteromyomectomy is the operation of necessity in bad cases; myomectomy is the operation of choice in good operative risks with favorably situated tumors.

If care is exercised and all of the nodules removed, the subsequent development of unrecognized myomata is uncommon (Mayo—two in 157 cases). Although no more than the "greater number" of the myomectomy patients (Mayo's series) were traced afterwards, 18 in their series of 296 cases required subsequent operation (hysterectomy in 12).

When the uterus is removed with the myomata, what shall be done with the adnexa? The advantage in preserving the ovaries lies in the avoidance thereby of the disagreeable and annoying symptoms of an artificial menopause. The disadvantage is that the adnexal organs left behind may subsequently become diseased and require a second operation for their removal. Both possibilities have been exaggerated, the one by those who champion the conservative plan, and the other by those who favor the radical plan. An artificial menopause is not often distressing within a few years of the menopause, and if the adnexa are entirely normal the chances are that they will remain so if in the performance of hysteromyomectomy their blood supply is carefully preserved. In a patient approaching or past the menopause age it is better, as a rule, to remove the adnexa, while in younger women it is preferable to allow them to remain. In women under thirty-five every effort should be made to preserve the ovaries. If one ovary is diseased and the other is healthy, the diseased one should be removed and the other left *in situ*. It is better to do this than merely to resect the diseased area and to allow the rest of the ovary to remain. If possible the rule of either letting an ovary alone or taking it out entirely should be adopted. The resection of a part of an ovary is often followed by a recurrence of trouble, so that it should be avoided if possible, especially if the opposite ovary is entirely healthy. Resection of both ovaries may be required when they are diseased, even though the woman is young, or the worst one may be removed *in toto* and the other one resected. If it is not possible technically to leave either ovary *in situ*, a portion of one of them may be transplanted into the fat of the abdominal wall. When the ovaries are conserved the tubes also should be allowed to remain if they are healthy. This assures a preservation of the ovarian blood supply. If the tubes are diseased, however, and require removal, they should be neatly trimmed off the top of the

broad ligament and the catgut sutures used to control the bleeding tied as closely as possible to the tube.

When a myoma has undergone malignant degeneration, or is complicated by a carcinoma of the body of the uterus or of the cervix, removal of the entire uterus including the cervix, **panhysterectomy**, is absolutely necessary. On account of the danger of overlooking carcinoma of the cervix in a myomatous uterus and because a cervix left behind after supravaginal hysterectomy has subsequently become carcinomatous, some operators recommend complete hysterectomy, as a rule, instead of supravaginal amputation. There are many objections to such a course. Complete hysterectomy is a more difficult and a more dangerous operation than supravaginal hysterectomy. It is objectionable in married women because it shortens the vagina. Furthermore, such a course is unnecessary. An early carcinoma of the cervix or the body of the uterus complicating myoma may be detected previous to, or at the time of, operation if the cervix is carefully examined and the endometrial cavity curetted. By this precaution the danger of overlooking malignant trouble is avoided. In doubtful cases the major operation should be postponed until curetted particles or excised pieces of tissue can be submitted to microscopic examination. If curettement of the uterus has been unsatisfactory or impossible on account of distortion or inaccessibility of the endometrial cavity, the uterus should be opened in the operating room immediately after the supravaginal amputation. If, then, there are any evidences of malignant complications the cervix should be removed forthwith.

In spite of the precautions above detailed, occasionally an incipient cancer of the cervix will be overlooked or a cancer will develop in the cervix subsequent to a supravaginal hysteromyomectomy. Therefore, any patient who has bloody discharge following hysteromyomectomy should be examined without delay in order to detect trouble of this nature.

Carcinoma of the cervical stump in an early stage should be dealt with by excision; if the disease has not advanced beyond the cervix an abdominal operation, with dissection of the ureters and wide excision of the parametrium and vaginal vault, is the procedure of choice. In late cases, vaginal excision with the cautery may be tried. If radium is available it is preferable to any form of operation.

OPERATIVE TECHNIC

All operations for myomata of the uterus are preceded by dilatation of the cervix and curettement. The purpose of this plan is three-fold. First, it insures thorough disinfection of the vagina so that if panhysterectomy becomes advisable the vaginal part of the operative field is already prepared. Furthermore, if there is any reason to believe that the cervix or uterine cavity is not sterile an attempt can be made to make it so, as described on page 324. Secondly, hypertrophied mucosa is removed by curettement for the reason that if the operation of removal of the tumor is limited to a conservative myomectomy, the uterus is left in a healthier state than if an hypertrophied endometrium were allowed to remain. Thirdly, a curettement prevents a failure to recognize already existing malignant disease in the cervix or body of the uterus. If the character of the curetted

particles is such as to leave no reasonable doubt of their malignant nature, a panhysterectomy is indicated. If the contrary is true and they are unquestionably benign, myomectomy or supravaginal hysteromyomectomy may be selected. If there is any doubt as to the existence of malignancy, further operative procedure should be postponed until careful microscopic study of the tissues can be made.

Abdominal Myomectomy.—After a median incision and exposure of the uterus, the exact position and relations of the tumor or tumors is carefully investigated. If the case is a suitable one for myomectomy, the uterus is surrounded by a double layer of gauze packs so as to completely isolate it from the neighboring areas. Pedunculated subperitoneal tumors may be removed by a simple wedge-shaped incision of the pedicle, the two lips of the wound being brought together with sutures. If the tumor is large, and the pedicle is small and vascular, the peritoneal reflection from the

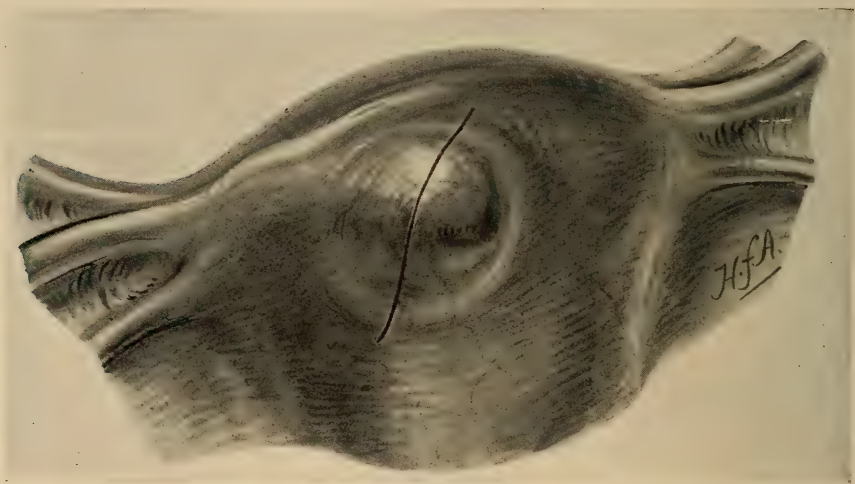


FIG. 311.—Abdominal myomectomy. Line of incision through capsule of myoma.

uterus may be circumcised and pushed back toward the uterus and the pedicle ligated with fine catgut, the peritoneum then being drawn over the cut surface of the pedicle and united with a fine running suture. If the tumor is sessile or intramural, one of two methods may be used for its extraction. By the first, after the incision has divided the surrounding tissue down to the capsule of the growth, an attempt is made by a blunt dissection to follow its circumference, separating the tumor from the uterine wall. This will be successful in small and well encapsulated growths. In larger ones, and those more firmly attached, a better plan is to carry the incision directly through the tumor to its opposite pole; in other words, to bisect the growth, and then, catching each half with a vulsellum, separate each side in turn from its bed in the uterine wall. Bleeding may be controlled during this process by manual compression of the vessels of the broad ligament on either side, or intestinal forceps protected with rubber may be applied to the broad ligaments. As a rule, manual compression is to be preferred. After

the tumor has been enucleated the more prominent bleeding points should be caught with forceps and ligated free or with mattress sutures. The bed of the tumor is then filled up by the introduction of fine interrupted or continuous catgut sutures, while the peritoneal wound is approximated by a running suture of fine catgut. It is very important that the entire bed of the tumor be completely approximated or filled up, and that the peritoneal incision be closed in such a fashion that there is no raw area exposed to which adhesions might occur (Figs. 311 to 315).

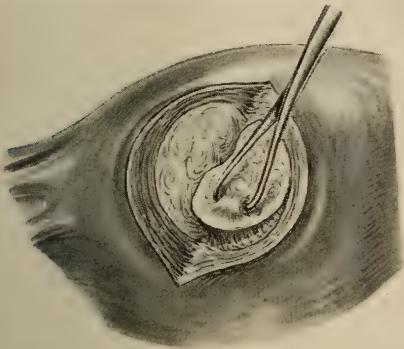


FIG. 312.—Abdominal myomectomy. After making the incision the myoma may be bisected and each half caught in turn and dissected out.

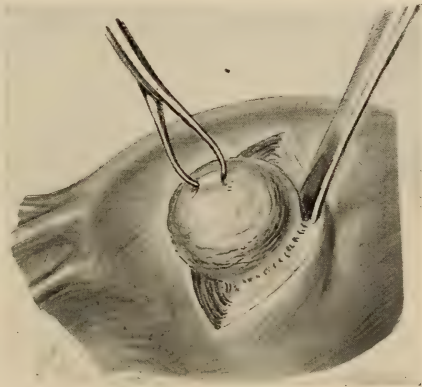


FIG. 313.—Abdominal myomectomy. After exposing the myoma it may be shelled out [by blunt dissection].

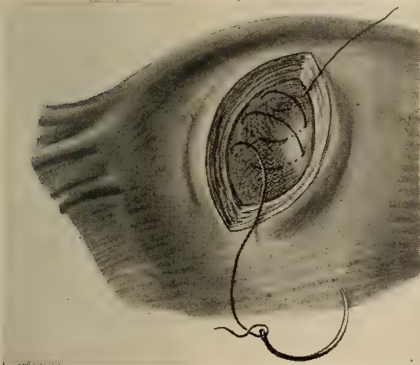


FIG. 314.—Abdominal myomectomy. The bed of the myoma is carefully filled up with running catgut sutures. Large bleeding points are tied.

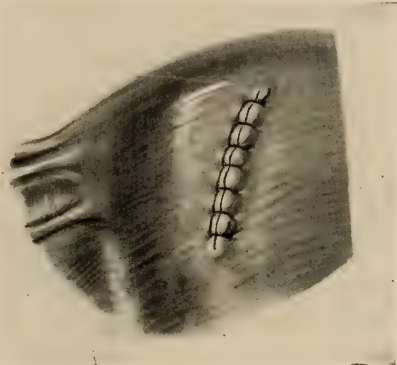


FIG. 315.—Abdominal myomectomy. The uterine incision is closed with a suture of fine catgut; careful approximation of the peritoneal edge is secured.

Where a number of nodules are to be removed from the same uterus, it is an advantage, if possible, to so plan the incisions that they lie in the same general direction, or in such a way that one peritoneal incision will answer for the enucleation of more than one tumor. The latter is rarely feasible. In some cases it may be desirable, in order to avoid a dead space or badly coaptated surfaces, to remove some of the uterine wall. There is no objection to this when it becomes necessary, although it should be avoided when possible. Although the uterus may appear quite misshapen and out of pro-

portion at the conclusion of the operation, subsequent involution may restore the organ to approximately normal form.

Vaginal Myomectomy.—Vaginal myomectomy may be a very simple operation consisting of no more than a V-shaped division of the pedicle of a small tumor. Great difficulty, however, is encountered in tumors of considerable size, which spring from the cervix and greatly distend the vagina and

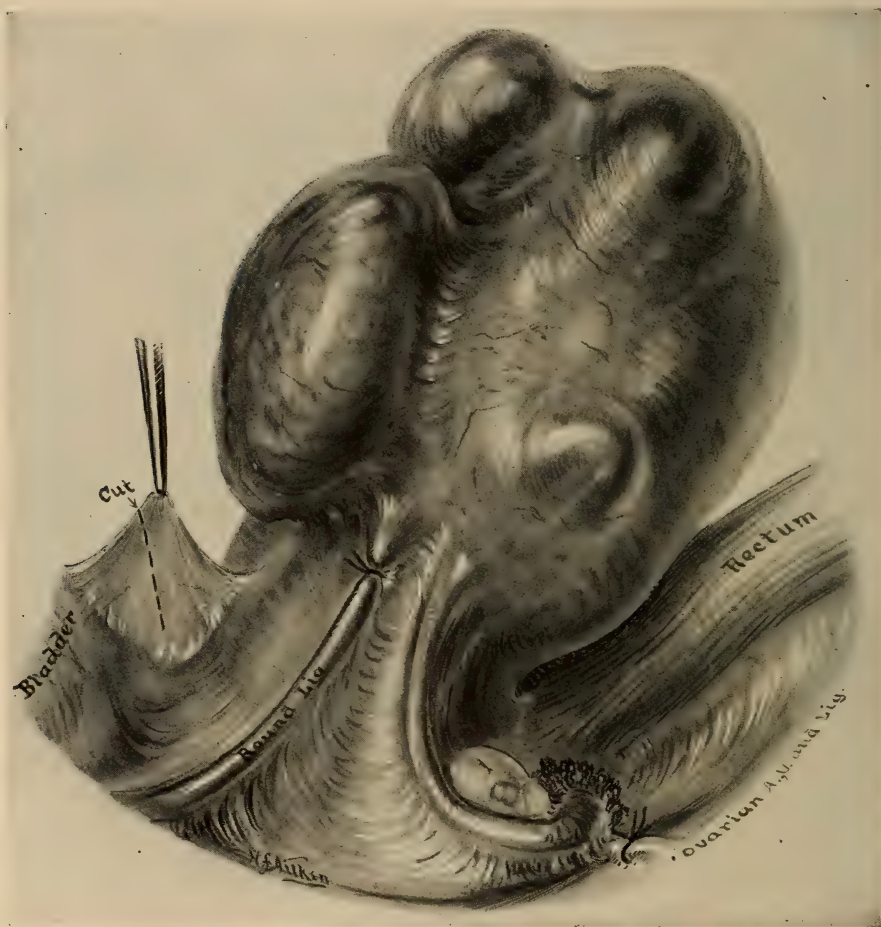


FIG. 316.—Supravaginal hysteromyomectomy with bilateral salpingo-oöphorectomy. The ovarian vessels and the round ligament have been tied. The utero-vesical fold of peritoneum is about to be divided.

perineum in nulliparous women. If the pedicle is broad, and the attachment of the cervix difficult to reach and expose by means of the usual specula and retractors, a paravaginal incision should be made as a preliminary step in the operation. This affords easier access to the operative area. The tumor should then be divided in the median line directly up to its attachment with the cervix, and each half shelled out separately. The excess of capsule should be cut away, and the wound closed with interrupted catgut

sutures. Vaginal myomectomy is sometimes employed for submucous growths which cannot be exposed until the uterine cavity has been opened by hysterotomy. In performing this operation, the anterior surface of the cervix and uterus are exposed by dividing the anterior vaginal wall transversely, close to its reflection, and then pushing up the bladder from the uterine surface. The incision of the uterine wall is made directly in the median line, and a succession of vulsella are placed on either side, from below upward, as the uterus is drawn down, until a point sufficiently high to expose the tumor has been reached. After removal of the growth the line



FIG. 317.—Supravaginal hysteromyomectomy with bilateral salpingo-oöphorectomy. A curved clamp has secured the uterine extremity of the broad ligament. The tube and ovary have been cut away from the broad ligament as far as the clamp.

of incision in the anterior uterine wall is closed with interrupted catgut sutures. The vaginal wall is then united to the cervix.

Hysteromyomectomy.—After the preliminary preparations have been completed, a median abdominal incision should be made, the uterus exposed, and the intestines packed off from the pelvic cavity. The position and number of the tumors are noted, as well as the condition of the adnexa. If the adnexa are adherent and easily accessible, they should be released from adhesions at once, and the fibroid uterus pulled up through the incision. This is always possible in tumors of moderate size which are not intraligamentous or subvesical in position. If the tumor has developed from a point

low in the uterus, from the cervix, for example, and has grown between the layers of the broad ligament or the mesosigmoid, or if it lies beneath the bladder, early delivery will not be feasible, and certain modifications of the operation will have to be carried out.

A simple hysteromyomectomy with bilateral salpingo-oöphorectomy is performed as follows: The uterus is drawn over to one side of the pelvis and a point in the opposite broad ligament outside the ovary, which is free from blood-vessels, is selected. A catgut ligature is passed through this space and



FIG. 318.—Supravaginal hysteromyomectomy with bilateral salpingo-oöphorectomy. The round ligament and the broad ligament have been divided, exposing the cellular tissue as far down as the cervix, the bladder has been pushed away from the front of the cervix. The position of the uterine artery is being located with the finger.

tied over the top of the broad ligament, securing the ovarian artery and veins (Fig. 316). A second ligature is now passed about the round ligament at a point somewhat nearer the uterus than the first ligature. This procedure is carried out upon the opposite side. A clamp is then placed along the lateral surface of the uterus, embracing the origin of the round ligament, the uterine extremity of the tube, the utero-ovarian ligament, and the utero-ovarian anastomosis, the end of the clamp pressing close to the side of the uterus so as to occlude the uterine vessels above the point where the division of the cervix is contemplated (Fig. 317). The broad ligament

on one side is divided to the median aspect of the ligatures which have been applied, down to the end of the clamp which has been placed on that side of the uterus (Fig. 318). The vesical reflection of the peritoneum is then picked up from the anterior surface of the cervix and divided from the incision which has been made in the broad ligament across the front of the cervix to a corresponding point on the opposite side. The division of the broad ligament on the opposite side is then carried out in a similar manner. The uterine artery and veins on each side are located by palpation, and a suture passed about them with a needle (Fig. 319)), the suture embracing a few of the lateral muscular fibers of the cervix. These sutures are tied, and the vessels are cut half an inch above it. The cervix is now divided transversely, by means of a wedge-shaped incision. The operation may be car-



FIG. 319.—Supravaginal hysteromyomectomy with bilateral salpingo-oophorectomy. A ligature has been thrown around the uterine vessels. Division of the cervix may now be done. The clamp controls the reflux circulation.

ried out from left to right, or from right to left, if the operator so desires, tying the vessels on the side of approach and catching them with forceps on the opposite side after division of the cervix; or all the vessels on both sides may be clamped and ligatures applied after the uterus has been removed (Figs. 320 and 321). After double ligation of both uterine vessels, the lips of the cervix are brought together in an anteroposterior direction, the outer approximating suture at either side of the cervix being made to include the end of the round ligament which is drawn over to it. The raw surfaces are covered by approximating the vesical reflexion of the peritoneum to the peritoneum of the posterior surface of the broad ligament and Douglas' pouch (Figs. 322 and 323).

When adhesions of the uterus itself, or the adnexa, complicate the method of operation just described, they should be freed at once and the operation reduced to an uncomplicated series of maneuvers. If, however, the adhe-

sions are dense, it may be advisable to begin the hysterectomy on the most accessible side, approaching the difficult side from below, after division of the cervix (Fig. 320). When both sides are seriously involved, but the fundus is accessible, the uterus may first be bisected in the median line as far as the cervix. Each half of the uterus is then in turn divided, the uterine vessels secured, and the separation of adhesions effected by working from below upward.



FIG. 320.—Hysteromyomectomy from side to side.

If the fundus is also buried in adhesions, the vesical peritoneum should be divided, the bladder pushed off the anterior surface of the uterus, and the cervix located and divided transversely from the median line to either side, until the uterine vessels are exposed. After ligating them the proximal section of the cervix should be caught with a tenaculum and pulled upward, and the separation of the uterus and adnexa proceeded with from below upward.

The operator may thus vary the technic of operation to suit the conditions which confront him in the individual case. An intraligamentous tumor on one side may be approached from the opposite side, enucleation of the tumor being attempted only after the opposite broad ligament has been secured and divided, and the cervix cut across. The uterine vessels on the affected side may then be carefully secured and the enucleation of the tumor



FIG. 321.—Supravaginal hysteromyomectomy with bilateral salpingo-oophorectomy. Showing detail of ligating the clamped uterine artery; the vessel is first tied against the cervix and then picked up with an artery forceps and ligated individually with the same suture.

effected from below. Sometimes it may be of advantage and feasible to ligate the ovarian pedicle and the round ligament on the difficult side before attacking the opposite broad ligament. The point of division of the cervix must be sufficiently low to expose the cellular tissue of the broad ligament close to the lower pole of the tumor or beneath it.

In the case of a subvesical development of the tumor the first step in the operation should be an incision of the vesico-uterine fold of peritoneum and the separation of the bladder from the front of the uterus and the tumor.

After this has been accomplished the uterus will be more easily delivered, and the operation can be concluded often in the customary manner.

All plans of operation remain more or less difficult and potentially dangerous until the uterus and tumor are mobilized. Usually, it is desirable to have a firm grasp upon the myomatous uterus, and although this may be obtained in the case of small tumors by means of Museaux forceps, the corkscrew holder of Doyen is much to be preferred when the growth is large. Some mobility may be gained in almost every case by dividing the round ligament on one or both sides.

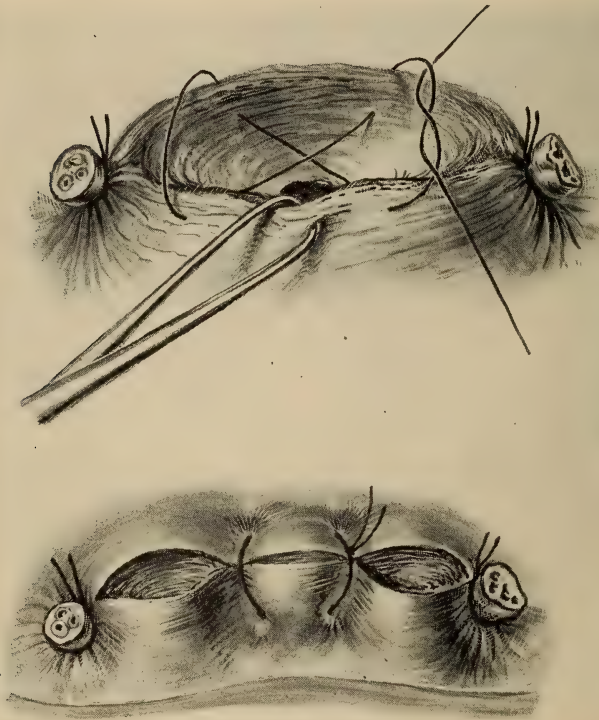


FIG. 322.—Supravaginal hysteromyomectomy with bilateral salpingo-oophorectomy, showing the cupping of the cervix which has been done during the supravaginal amputation and the introduction of the figure of eight suture to close the cervical stump.

The technic of hysteromyomectomy is varied, also, by the method of disposal decided upon for the tubes and ovaries. If the adnexa on one side are to be preserved, the division of the broad ligament on that side should be to the inner extremity of the tube, and through the utero-ovarian ligament. If the tube is diseased, and the ovary alone is to remain, the ligation of the mesosalpinx should be carried out in the same way as will be described under salpingectomy, the round ligament and the utero-ovarian ligament being ligated close to the uterus. If both adnexa are healthy, both ovaries and both tubes may be left. Conservation of the adnexa is unadvisable after the

age of thirty-eight, not only because the conserved structures will soon become useless, but also because they may later become diseased. Whether the ovary of one or both sides is conserved in conjunction with the tube, care should be taken that it is not left in too much of a dependent position. To avoid such a disposal, suspension to the round ligament may be practised (Figs. 324 to 326).

After hysterectomy the cervix should be suspended by attaching to it the cut extremity of the round ligament on both sides. When the operator has

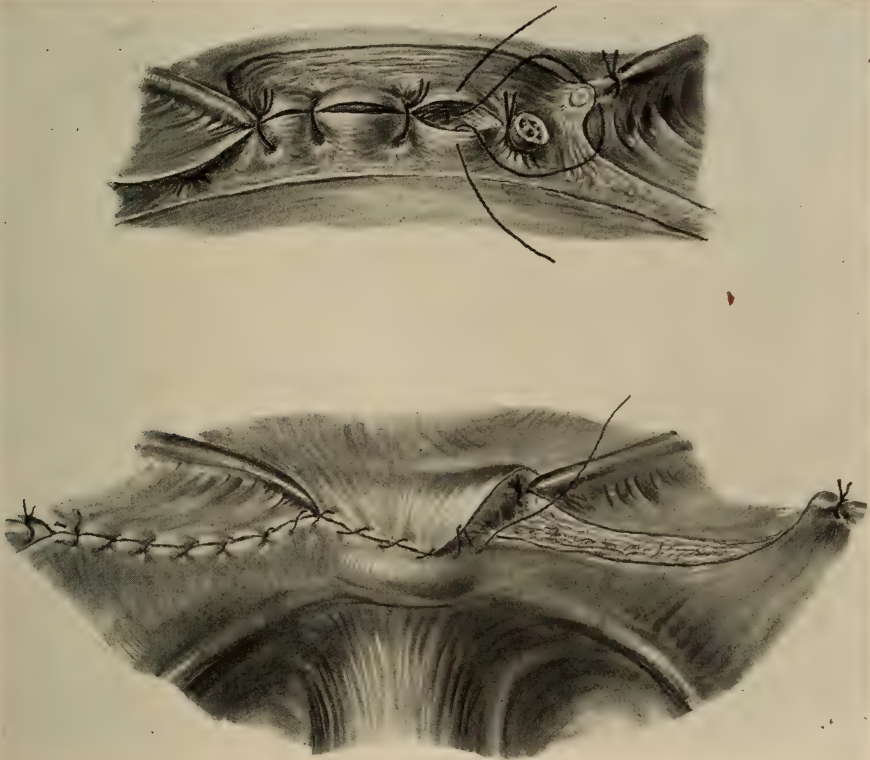


FIG. 323.—Supravaginal hysteromyomectomy with bilateral salpingo-oophorectomy, showing the transfixion of the round ligament with a suture that draws it between the outer raw lips of the cervix and anchors it in that position; showing also the suture of the peritoneum which covers in all the raw surfaces.

this in view at the beginning of the operation, he may provide for it by dividing the ligaments close to the fundus of the uterus. It should never be practised if it places tension on the pedicle of the infundibulo-pelvic ligament. One side at least may almost without exception be handled in this way.

In the performance of hysteromyomectomy, both the ovarian and the uterine vessels should be tied twice on each side. In addition to the two ligatures which secure each uterine artery, and are passed so as to include a little of the cervical tissue, the ends of the upper suture after the knot is tied should be passed about the uterine vessels themselves after the latter

have been isolated and grasped by a forceps (Fig. 321). In cutting through the cervix a wedge-shaped incision should be made so as to secure easy approximation of the cervical flaps.

If previous to operation the uterine cavity has not been invaded by any sort of intrauterine treatment, the cervical canal may be regarded as sterile, and no particular precautions are necessary upon dividing it; when, however, as a result of preliminary intrauterine treatment performed with a careless technic, or because of a necrotic submucous tumor in which the endometrium may be the site of infection, the cervical canal may

be infected, the greatest care must be exercised at the time it is opened. In such cases, previous to the abdominal section and after the preliminary dilatation and curettement, the entire uterine cavity, or as much of it as possible, should be packed with gauze saturated with the tincture of iodine. Under these circumstances the amputation of the uterus and the invasion of the cervical canal should be performed as the very last step in the abdominal removal of the uterus. The incision across the cervical canal should be made by means of a cautery knife, after very careful isolation of the area with gauze sponges. The exposed mucosa of the cervix should be destroyed with the cautery, or disinfected with carbolic acid, and the instruments and sponges used in this particular part of the operation should be discarded.

Panhysterectomy. — Panhysterectomy is the operation which

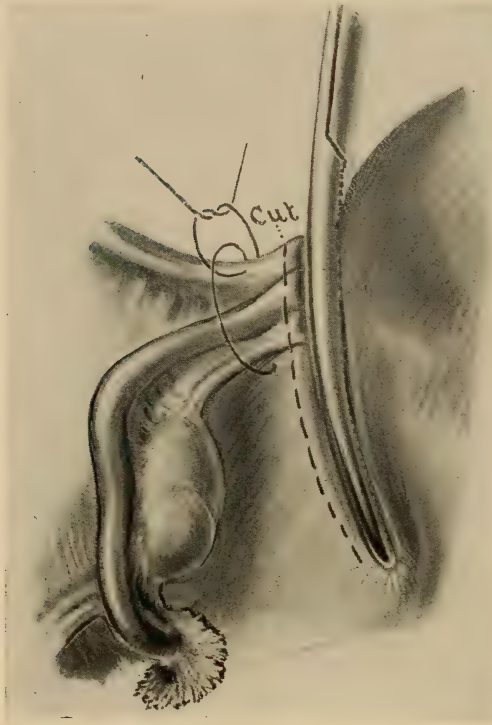


FIG. 324.—Supravaginal hysteromyomectomy with conservation of the adnexa. The position of the uterine clamp is the same as in Fig. 317, but the round ligament, the tube and the utero-ovarian ligament are ligated close to the clamp and the broad ligament is divided between.

may be preferred for myomatous uteri when the cervix is diseased, as by marked cystic degeneration, hypertrophy, or laceration with marked eversion; panhysterectomy is demanded when a fibroid tumor is complicated by a cancer of the endometrium or the cervix; panhysterectomy is necessary when the tumor occupies such a low position, or is so intimately involved with the cervix that it cannot be removed to the exclusion of the cervix. Panhysterectomy for myomata may be easy or difficult, depending upon the size, number, and position of the nodules. In simple cases the technic resembles that of panhysterectomy for cancer of the endometrium (see page 345). Panhysterectomy for fibroid tumor complicated by cancer of the cervix

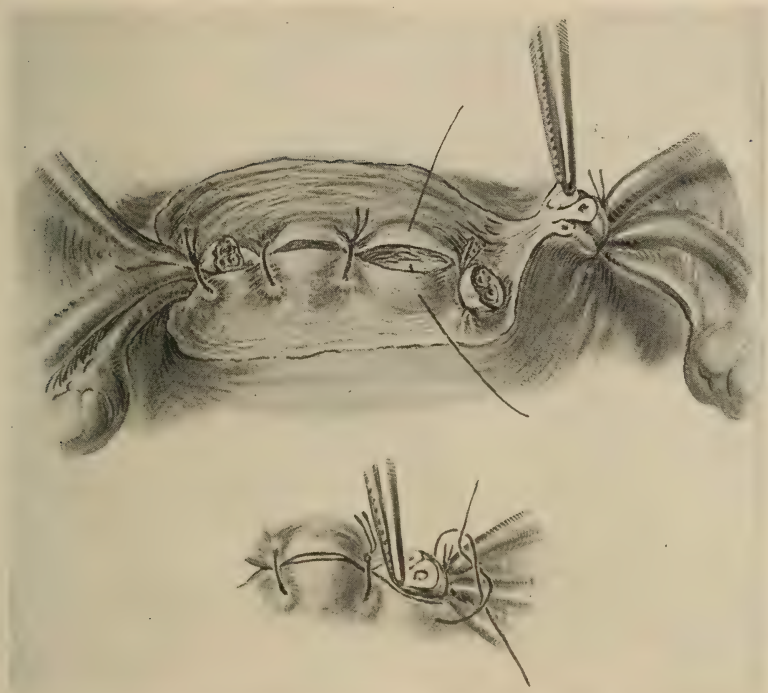


FIG. 325.—Supravaginal hysteromyomectomy with conservation of the adnexa. Anchoring the round ligaments to the cervix.



FIG. 326.—Supravaginal hysteromyomectomy with conservation of the adnexa. The operation completed and the raw surfaces covered.

must be more radical, the same technic being employed as in panhysterectomy for cancer of the cervix (page 349).

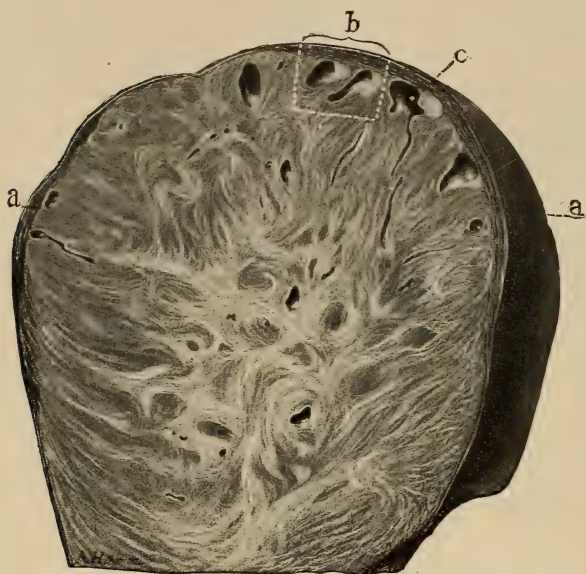


FIG. 327.—Diffuse adenomyoma of uterus. From Cullen's Adenomyoma of the Uterus. (W. B. Saunders Co.)

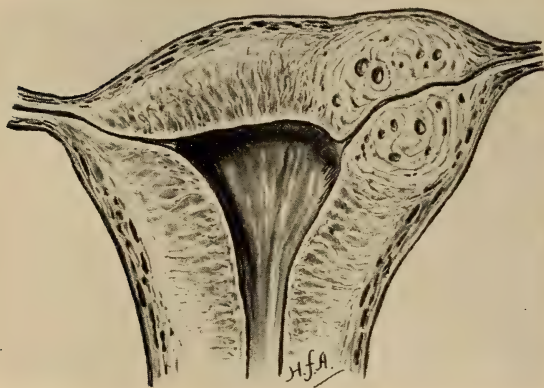


FIG. 328.—Longitudinal transverse section of uterus, showing adenomyoma of tubal angle. (Gynecological Laboratory, U. of P.)

In difficult cases of panhysterectomy for fibroid tumor, especially when the tumor is intraligamentous, great care is necessary to protect the ureters from injury. The base of the broad ligament may be so distorted that the uterine vessels are difficult to secure, and in ligating them the ureter may be inadvertently tied. The only way to prevent such a misfortune is to identify all structures as they are exposed. By far the best plan is to deliberately dissect the ureters, and then retract them out of harm's way. The ureter may be found displaced to the outer side of an intraligamentous tumor, or it may be lifted up by a tumor developing beneath, so that it courses over the superior aspect of the growth.

ADENOMYOMA¹

Pathology.—An adenomyoma of the uterus, as the name implies, is a new growth consisting of myomatous and glandular tissue. The adenomatous formation may be a diffuse one (Fig. 327), more or less uniformly

involving the entire uterine wall, and sometimes completely encircling the uterine cavity, or it may be limited to an area at one cornu of the uterus (Fig. 328), or along the lateral surface of the uterus in an intraligamentous

¹ Adenomyositis uteri is the term applied by Frankl to cases of diffuse thickening of the uterine wall with infiltration of the myometrium by gland-like formations resembling those found in adenomyomata but without any circumscribed tumor. He believes the condition to be of inflammatory origin, although in some cases no trace of inflammation can be found; these latter he calls "Adeno-Myosis Uteri." The glands may originate from

position, or it may be within the inner layers of the myometrium, forming a submucous tumor. Adenomyomata are not well circumscribed like the myomata; they cannot be shelled out from the area which they occupy. Adenomyomata also affect the isthmal extremity of the tube and the inguinal part of the round ligament. Cases have been described in which they were situated beneath the lower pole of the kidney and alongside the cervix, closely related to the vaginal vault. Adenomyomata of the rectovaginal septum² have been described by Cullen and others.

The essential histological features of adenomyomata, in whatever position found, are interlacing bundles of fibrous and muscular tissue, enclosing within their strands patches of glands and stroma closely resembling the endometrium. In the diffuse adenomatous formation, this glandular tissue undoubtedly is an ingrowth from the endometrium, and Cullen has shown that the same is true of a large proportion of cornual and intraligamentous adenomyoma.

Symptoms.—Adenomyomata exhibit the general symptoms and course of the ordinary myomata. The first symptom usually is an increase in the

post-fœtal proliferation of the endometrium, or misplaced parts of the Müllerian ducts—not from the Wolffian system. When the gland formations are found in the outer layers of the uterine wall, they may have originated in the serosa.

It is possible that adenomyomata of the outer extremity of the round ligament, the lower pole of the kidney, and the mesosalpinx (epi-öophoron) may be derived from rests of the Wolffian body, as believed by von Recklinghausen. By reason of their structure, adenomyomata sometimes become cystic. Carcinomatous degeneration of the glands may also occur.

² Adenomyoma of the recto-vaginal septum at first forms a very small tumor in the vaginal vault just behind the cervix; or it may be recognized first as a round or irregular thickening, not over one cm. in diameter, behind and usually attached to the cervix. The growth usually spreads in a diffuse and irregular manner, involves the adjacent anterior rectal wall, and spreads into one or both broad ligaments, until finally everything in the pelvis may be firmly glued into one mass. The symptoms depend largely on the manner in which the growth extends. Small adenomyomata give little trouble. Rectal involvement may cause pain; neuralgic pain may be caused by implication of the pelvic nerves; kidney pain by compression of the ureters. The menses are sometimes painful. If the mucosa of the adenoma opens into the vagina there may be vaginal hemorrhage at the menses; if the mucosa of the tumor extends through the rectal mucous membrane, there may be some rectal bleeding at the menses."

Cullen's conclusions as to treatment are as follows: "First, when small discrete nodules exist in the posterior vaginal vault they may be readily removed through a vaginal incision, as was so successfully done by Stevens.

"Second, when the growth occupies the posterior surface of the cervix and extends laterally, the ureters should be dissected out carefully and a complete abdominal hysterectomy be performed.

"Third, if the growth be firmly adherent to the rectum a wedge of the rectum should be removed, together with the uterus. It has been found best, after freeing the uterus on all sides, to open up the vagina anteriorly and laterally. The uterus and the rectum can be then lifted further out of the pelvis, thus facilitating the removal of the necessary wedge of the anterior rectal wall. The uterus can be used as a handle and the necessary rectal tissue and the uterus removed as one piece.

"Fourth, when the lumen of the bowel is greatly narrowed a complete segment of the rectum should be removed, together with the uterus, and an anastomosis made.

"Fifth, in desperate cases, where everything in the pelvis is glued together, an ideal procedure is out of the question. The patient in such a case cannot stand a long operation, and if she could a satisfactory result could not be obtained. Under such conditions it would be better to cut across the sigmoid, invert the lower end, close it, and bring the upper end out through the abdominal wall of the left iliac fossa, making a permanent colostomy. When the patient has to some extent regained her strength, the uterus, the lower portion of the rectum, and the broad ligament tissue can be shelled out as one piece.

"These growths, while histologically not malignant, remind one of glue. Unless they are completely removed, further trouble is liable to occur." (Cullen.)

length of the menstrual periods. Pain at the menstrual period is particularly pronounced, and is evidently due to the increase in the tension within the tumor, the islands of mucosa being congested like the true endometrium, and hemorrhage occurring into the glands. Adenomyomata do not attain the enormous size of fibromyomata. Not infrequently they are associated with inflammation of the adnexa.

Diagnosis.—The diagnosis of adenomyomata in distinction from fibromyomata is rarely practicable.

Treatment.—The treatment is hysterectomy with preservation of the ovaries in younger women.

BIBLIOGRAPHY

- BAER, B. F.: "Supravaginal Hysterectomy Without Ligature of the Cervix in Operation for Uterine Fibroids. A New Method." *Trans. Am. Gyn. Soc., Phila.*, 1892, xvii, 235.
- BEYEA, H. D.: "Conservation of Ovaries and Functionating Uterine Tissue in Hysteromyomectomy." *Amer. Jour. Obst.*, 1901, xlv.
- CLARK, J. G.: "Fibroid Tumor of the Uterus." *Progressive Medicine*, 1906; *Ibid.*: "The Cause and Significance of Uterine Hemorrhage in Cases of Myoma Uteri." *J. H. H. Bull.*, 1899, x, 94-96.
- CLARK, J. G., AND NOKKIS, C. C.: "Conservative Surgery of the Pelvic Organs in Cases of Pelvic Peritonitis and of Uterine Myomata." *Surg., Gyn. and Obst.*, 1910, xi, 398.
- CULLEN, T. S.: "Adenomyoma of the Recto-Vaginal Septum." *Trans. Amer. Gyn. Soc.*, 1917, xlii, 481; *Ibid.*: Adenomyoma of the Uterus. Saunders, Phila., 1908.
- DEAVER, J. B.: "Operative Treatment of Fibromyomatous Uterine Tumors." *Trans. Sect. O. G. and A. S., A. M. A.*, 1916, p. 319; *Ibid.*: "Hysterectomy for Fibroids of the Uterus." *Amer. Jour. Obst.*, 1905, lii, 858.
- DORAN, A.: "The Disappearance or Absorption of Fibroid Tumors Before the Menopause." *Jour. Obst. and Gynec., Brit. Empire*, 1904, vi, 141; *Ibid.*: "The Disappearance or Absorption of Fibroid Tumors of the Uterus." *Jour. Obst. and Gyn., Brit. Empire*, 1904, vi.
- DOYEN: "Hysterectomies Abdominales." *Arch. Prov. de Chir.*, Dec., 1892; *Ibid.*: *Technique Chirurgicale*. Paris, 1897.
- FENWICK, H.: "On Cardiac Degeneration from Pressure of Abdominal Tumors." *The Lancet*, 1888, i.
- FLECK: "Myom u. Herzerkrank, in ihren Genetischen Beziehung." *Arch. f. Gynäk.*, 1904, lxx, No. 1.
- GEHBARD: *Pathology Anat. des Weiblichen Sexualorgane*. Leipzig, 1899.
- GOFFE, J. R.: "A New Method of Supravaginal Hysterectomy, etc." *Amer. Jour. Obst.*, 1890, xxiii, 372.
- HUNNER, G. L.: "One Hundred Consecutive Cases of Myoma of the Uterus." *American Medicine*, July 11, 1903.
- KELLY, H. A.: "Hysteromyomectomy by Continuous Incision." *J. H. H. Bull.*, 1896, vii, 27.
- KELLY, H. A., AND CULLEN, T. S.: *Myomata of the Uterus*. Saunders, Phila., 1909.
- KNOX, J. H. MASON: "Compression of the Ureters by Myomata Uteri." *Am. Jour. Obst.*, 1900, xlii.
- LEGUEU, F.: "Des troubles Urinaires Provoqués, par les Fibromes du col Utérin." *Jour. d'Urologie*, 1912, i, 33.
- MCGLENN, J. A.: "The Heart in Fibroid Tumors." *Trans. Amer. Gyn. Soc.*, 1913, 38, 482.
- MAYO, WM. J.: "Some Observations on the Operation of Abdominal Myomectomy for Myomata of the Uterus." *Surg., Gyn. and Obst.*, 1911, xii, 97; *Ibid.*: "Myomas of the Uterus." *Jour. Am. Med. Asso.*, 1917, lxxviii, 887.
- NOBLE, C. P.: "Myomectomy." *N. Y. Med. Jour.*, 1906, lxxxiii; *Ibid.*: "The History of the Early Operations for Fibroid Tumor." *Amer. Jour. Obst.*, 1899, xi; *Ibid.*: "Fibroid Tumors; Degenerations and Complications." *Jour. Am. Med. Asso.*, December 8, 1906.
- OLSHAUSEN: "Über die Wahl der Operation bei Myomen." *Cent. f. Gynäk.*, 1902, No. 1.
- PELLANDA: *La Mort par Fibromyomes Utérins*. Paris, 1905.
- PFAHLER, G. E.: "Röntgenotherapy in Uterine Fibroids and Uterine Hemorrhage." *Amer. Jour. Obst.*, 1915, lxxii, 79.
- PICK, L.: "Ist das Vorhandensein der Adenomyome des Epioophoron Erwiesen?" *Centralbl. f. Gynäk.*, 1900, xxiv, 389-397.

- PIQUAND: "Fibromes et Cancers Utérins." *Annales de Gynécol. et d'Obstet.*, 1905.
- PRYOR: "A New and Rapid Method of Dealing with Intraligamentous Fibromata." *Med. News*, 1894.
- RECKLINGHAUSEN, VON, F. D.: *Die Adenomyome und Cystadenome der Uterus und Tubenwandung*—In Anhang: *Klinische Notizen zu den Voluminösen Adenomyome de Uterus*. W. A. Freund, Hirschwald, Berlin, 1896.
- SAMPSON, J. A.: "The Blood Supply of Uterine Myomata." *Trans Amer. Gyn Soc.*, 1911, xxxvi, 239; *Ibid.*: "The Influence of Myomata on the Blood Supply of the Uterus, with Special Reference to Abnormal Uterine Bleeding." *Surg., Gyn. and Obst.*, 1913, xvi, 144; *Ibid.*: "The Influence of Myomata on the Blood Supply of the Uterus, etc." *Trans. Amer. Gyn. Soc.*, 1912, xxvii, 156.
- SMEAD, L. F.: "Cervical Fibroids." *Am. Jour. Obst.*, 1911, lxiv, 790.
- STIMSON: "Ligation of the Uterine Arteries in Their Continuity, in Hysterectomy." *N. Y. Med. Jour.*, xlix, 1889.
- SUTTON, J. B.: "Fibroids of the Uterus." *Science Reviews, Ltd.*, London, 1913.
- THEILHABER, A.: "Der Zusammenhang von Myomen mit Internen Erkrankungen." *Monatsch. f. Geb. u. Gynäk.*, 1910, Bd. xxxii, H. S., 455.
- VEIT, J.: "Ueber Vaginale Myomectomie." *Zeit. f. G. u. G.*, 1896, xxxiv.
- VINEBERG, H. N.: "What Is the Fate of the Ovaries Left in Situ After Hysterectomy?" *Surg., Gyn. and Obst.*, 1915, xxi, 559.
- WEBSTER, J. C.: "A Consideration of Fibroid Tumors of the Uterus Based Upon a Study of a Series of Two Hundred and Ten Cases Treated Surgically." *Am. Med.*, 1905, 401.
- WINTER: "Die Wissenschaftlichen Grundlagen der Conservative Myomoperation." *Zeit. f. Geb. u. Gynäk.*, 1905, lv; *Ibid.*: "Die Wissenschaftlichen Begründung der Indikationen zur Myomoperation." *Zeit. f. Geb. u. Gynäk.*, 1905, lv; *Ibid.*: "Die Malignen u. Benigen Degeneration der Uterusmyome." *Zeitsch. f. Geb. u. Gynäk.*, 1906, lvii, 8.
- ZWEIFEL: *Ueber die Behandlung der Myoma*. *Cent. f. Gyn.*, Bd., 1899, xxiii.

CHAPTER XVIII

MALIGNANT TUMORS OF THE UTERUS

CARCINOMA OF THE UTERUS

Situation.—Carcinoma may affect either the cervix or the body of the uterus. A cervical carcinoma may have its origin in the mucosa of the vaginal portion of the cervix or in that of the cervical canal. Carcinoma in the body of the uterus grows from the endometrium.

Etiology.—The cause of carcinoma is not known. In the majority of cases it occurs at about the time of the menopause; it is rare before the age of thirty-five, but sometimes develops after the age of fifty. The disease is believed to be less frequent in the negro than in the white race. The poorly nourished and those who live amid unhygienic surroundings are said to be predisposed. That the disease is infectious has been repeatedly insisted upon, and many instances of the apparent prevalence of cancer in certain localities, and of the development of the disease in different persons living in the same house ("cancer house"), at various times, have been observed. Direct transference of cancer from a patient to the attending physician or a nurse has not been observed, and the experimental proof of the infectious nature of the disease has yet to be adduced. Among other causes to which the occurrence of carcinoma has been attributed are the abnormal proliferation of embryologic inclusions of alien tissue. There seems to be little evidence that heredity plays an important part. What is known as the biologic theory, namely, that cancer is the result of repeated traumatisms which finally induce an unlimited proliferation of the irritated epithelial cells, seems to apply particularly to carcinoma of the cervix, for except in women who have borne children, the disease is very rare in this situation. The apparent exceptions to this rule, on careful inquiry, will often be found to have been the subjects of some operative procedure upon the cervix, such as dilatation. Although this clinical fact may admit of other interpretations, it is, nevertheless, true that childbirth with its attendant laceration of the cervix predisposes to the development of carcinoma in the cervical portion of the uterus. Statistics collected by Frankl show that only 3 per cent. of cervical carcinomas develop in nulliparous women. This does not seem to apply to carcinoma of the body of the uterus, which affects nulliparæ quite as often as women who have borne children, and in them some other explanation for the occurrence of carcinoma must be found. Sometimes, unquestionably, the irritation produced by a fibroid nodule in the wall of the uterus favors the development of carcinoma of the endometrium, and in these cases it may be that a diffuse or a circumscribed hypertrophy of the endometrium has preceded the development of the carcinoma. Carcinoma of the cervix occurs about ten times as frequently as carcinoma of the body of the uterus.

CARCINOMA OF THE CERVIX

Pathology.—Carcinoma of the cervix may partake of one of two histologic types: (1) The squamous-celled carcinoma (epithelioma) when it springs from the squamous epithelium covering the vaginal surface of the cervix (Figs. 329, 330 and 331); (2) the columnar-celled or glandular variety, adenocarcinoma, when it springs from the high columnar epithelial cells of the folds and glands of the cervical mucosa (Fig. 336). As carcinoma develops most frequently in a cervix which has been lacerated and everted, it is often difficult, by gross examination, to determine in which of the situa-

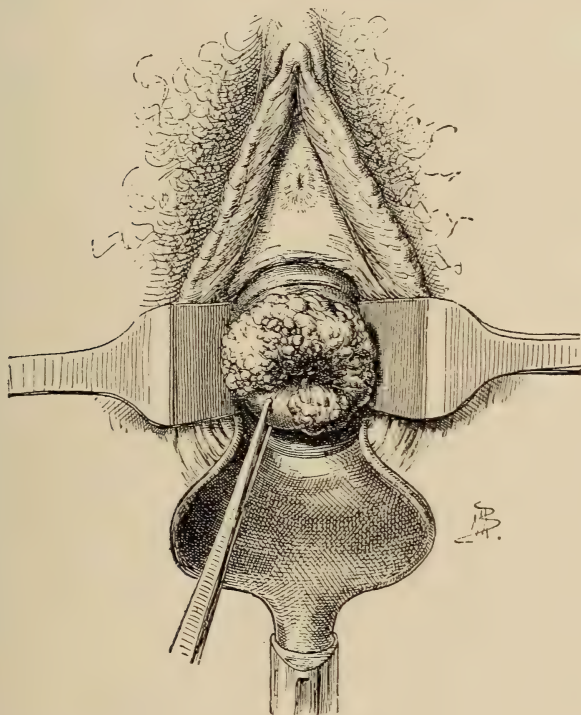


FIG. 329.—Epithelioma of the cervix (Cullen's Cancer of the Uterus, W. B. Saunders Co.).

tions noted it has originated. Even by histologic examination it may be impossible in the later stages to determine whether the growth was originally an epithelioma or an adenocarcinoma, since in advanced cases they both present very much the same features. Epithelial pearls may, however, serve to distinguish an epithelioma and a glandular structure an adenocarcinoma.

Carcinoma of the vaginal surface of the cervix has a tendency to spread to the neighboring mucous membrane of the vaginal vault, and then to involve the cervical canal. Carcinoma of the cervical canal is more likely to penetrate the wall of the cervix and invade the cellular tissue between the layers of the broad ligament. Both varieties, however, may extend in either

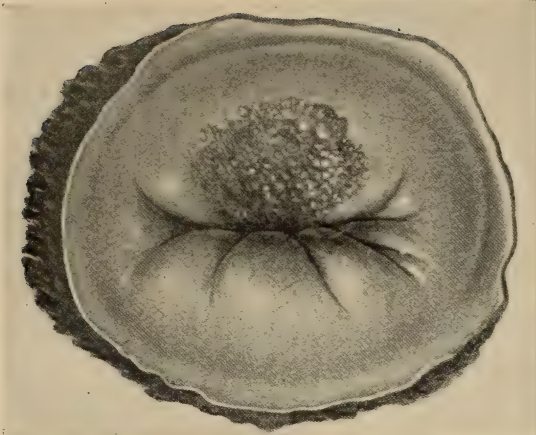


FIG. 330.—Early epithelioma of the cervix. (Anspach in Martin's Surgical Diagnosis, Lea and Febiger.)

of the directions mentioned, and as the disease progresses usually do. Carcinomata spread by a continuity of growth upon the surface and by the deportation of cancer cells along the lymph radicals of the broad and uterosacral ligaments (Figs. 332 to 334). These lymph-vessels pass from the cervix and the vaginal vault through the paravaginal and paracervical cellular tissue to the hypogastric and the iliac glands and to those lying alongside the rectum over the sacrum. In advanced

cases, and even in some of the early ones of a more malignant type, the obturator glands may also be involved.

In advanced carcinoma of the cervix, the involvement of both the surrounding and distant structures may be very extensive. The vesicovaginal septum may be extensively infiltrated, so that ultimately the tissue between the bladder and vagina breaks down with the formation of a vesicovaginal fistula. Infiltration of the rectovaginal septum may also occur, but, as a rule, much later, and it is not so likely to result in a fistulous communication between the bowel and the vagina. The bases of the broad ligaments and of the utero-sacral ligaments may be converted into indurated, unyielding areas of stony hardness, which fix the structures within their grasp. The ureters may be completely surrounded, and there may be some obstruction to the passage of urine through them, causing hydroureter and hydro-nephrosis, even though



FIG. 331.—Squamous cell carcinoma of the vaginal cervix. The entire vaginal surface of the cervix is involved. (Gynecological Laboratory, U. of P.)

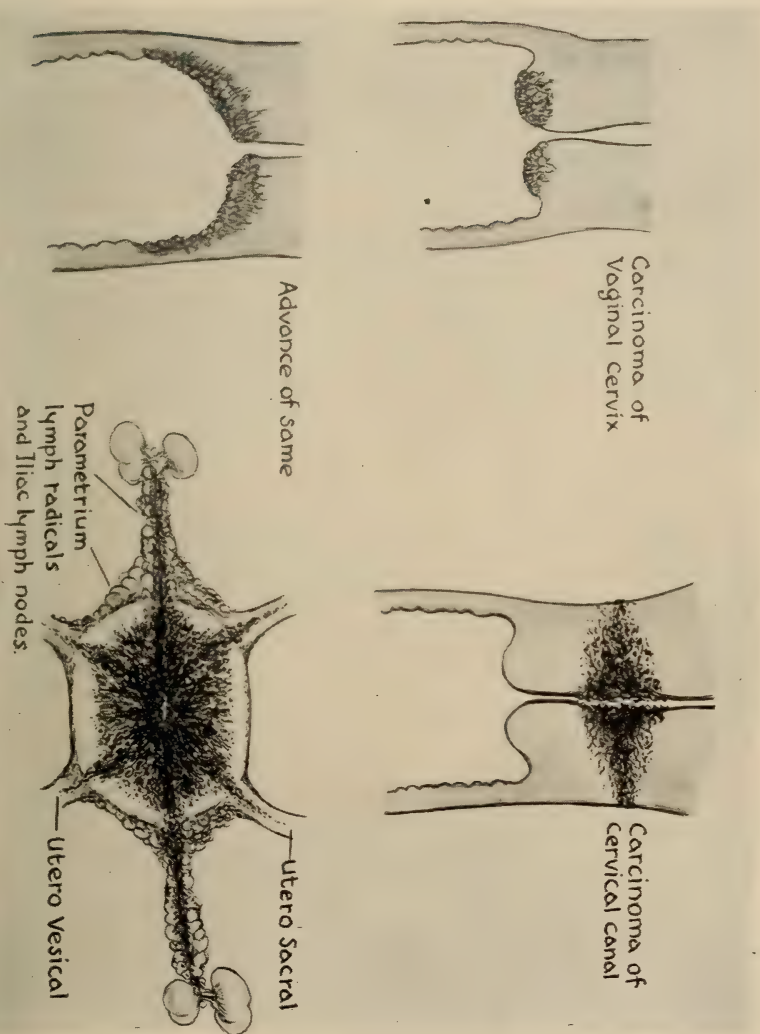


FIG. 332.—Sagittal and horizontal sections, diagrammatic to show the predisposition of epithelioma to spread by continuity of surface to the vaginal vault, and the predisposition of adeno-carcinoma of cervix to extend to the parametrium, hypogastric and iliac glands and to the uterosacral and uterovesical ligaments by way of the lymphatics.

there is no actual carcinomatous infiltration of the ureter itself.

Carcinomatous infiltration of the pelvic nerves occurs in late cases. The infiltration and lymphatic enlargement may exert sufficient pressure upon the veins to produce œdema of the lower extremities. When the lymphatic involvement has progressed to a certain extent, the lumbar glands become diseased, and then there may be metastasis to distant parts of the body. Remote metastasis is not so frequent, except in the last stages, in carcinoma of the cervix as in carcinoma of the body of the uterus. Though carcinoma of the cervix spreads in all directions, it does not affect the fundus of the uterus except in the most advanced cases.

Coincident with the progressive extension and advancement of the car-

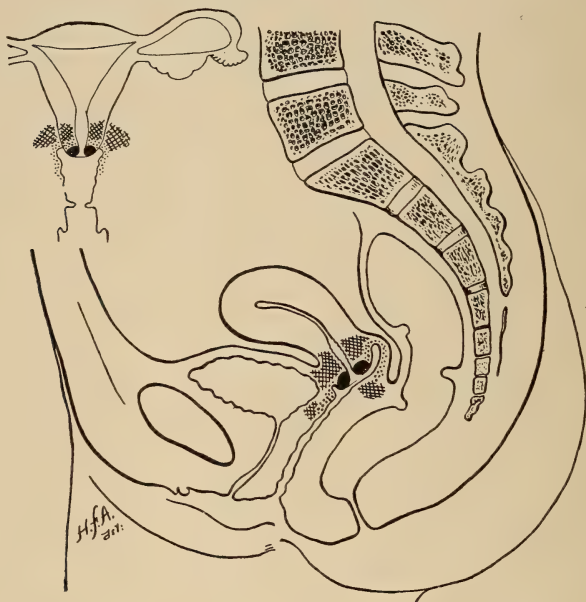


FIG. 333.—Diagrammatic sketch to show the spread of epithelioma of the cervix, sagittal and transverse sections; black area represents original site; dots, the early areas of extension; crossed lines, the ultimate involvement.

cinomatous disease into new areas, there is a breaking down, a necrosis, and an infection of the areas previously or originally involved. Thus, in an advanced case, the cervix is often entirely destroyed, and in its place an excavated ulcer, with hard, indurated edges bleeding easily on touch, is found which may be covered with a necrotic, foul-smelling discharge. The ulceration is the result of an insufficient blood supply to the new growth plus an infection (Fig. 335). The streptococcus is a frequent dweller in carcinomatous ulcers. Carcinomatous stenosis, or occlusion of the cervical canal, with coincident infection, may lead to the production of pyometra.

From what has been said it is evident that cancer of the cervix may appear in **three clinical forms**:

First, the **proliferating** or **vegetating** (cauliflower) form—usually an epi-

thelioma beginning on the vaginal part of the cervix and forming a luxuriant mass which projects into the vaginal vault.

Second, the **infiltrating** or **indurated**—usually an adenocarcinoma beginning in the cervical canal and infiltrating its way into the broad ligament, causing stony induration and hardness.

Third, the **ulcerating** or the **excavating** form—either the proliferating or infiltrating type—after the carcinomatous tissue has broken down and been discharged, with the formation of large ulcers or craters.

Symptoms.—There are no symptoms pathognomonic of cancer. The most frequent symptom of cervical cancer is hemorrhage (Fig. 336). Rarely

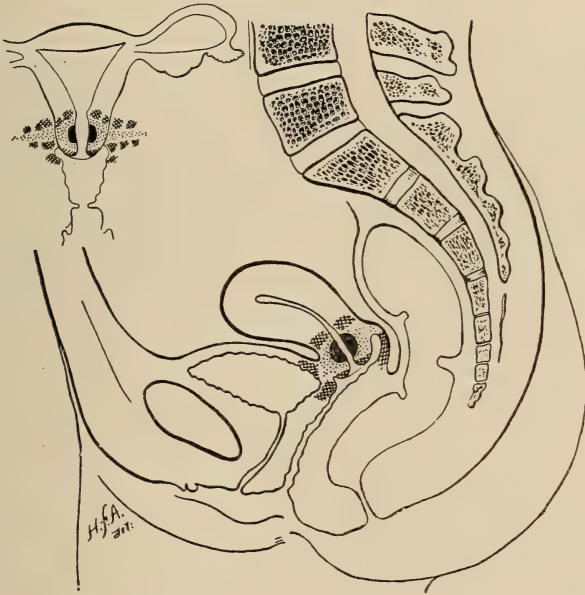


FIG. 334.—Diagrammatic sketch to show the spread of adenocarcinoma of the cervix: sagittal and transverse sections; black area represents original site; dots, the early areas of extension; crossed lines, the ultimate involvement.

at the start this may take the form of an increased menstrual flow; usually, in the early, and always in the later stage, it occurs between the menstrual periods, either without any apparent reason, or induced by douching, sexual intercourse, defecation, riding over a rough road, or by something that acts as a trauma to the delicate carcinomatous villus, which consists of a capillary blood-vessel surrounded by a thin layer of carcinoma cells. The amount of hemorrhage may be very slight, and usually in the early case consists of but a few drops; in exceptional cases, however, it may be profuse. Preceding the onset of hemorrhage there may be a discharge having the appearance of a leucorrhœa or an increase in one which existed previously, or again the discharge may become streaked with blood, or assume a reddish or a brownish appearance. These are the only subjective symptoms of an early

carcinoma; they are often regarded with equanimity by the patient, and considered a natural phenomena incident to the menopause.

Later on, when the disease has become advanced and hemorrhage is more frequent and profuse, there is a discharge of putrid, broken-down carcinomatous tissue; the woman complains of pain from carcinomatous infiltration of the broad ligaments, bladder, bowel, ureters, or pelvic nerves; functional disorders of the neighboring viscera occur, and a cachexia develops, which is partly the result of hemorrhage and partly due to disturbance of the excretory functions and the absorption of toxins from the necrotic cancer tissue. It should never be forgotten *that the latter symptoms are those of a hopeless case of carcinoma!* The recognition of malignant disease



FIG. 335.—Advanced epithelioma of the cervix. The vaginal cervix has been destroyed by the growth which has reached the internal os. Typical cauliflower type of growth. (Gynecological Laboratory, U. of P.)

after such symptoms have appeared is usually of no avail. As soon, therefore, as a patient complains of the slightest irregular hemorrhage, a thorough examination should be made, for it is only in this way that carcinoma may be recognized in an early stage.

Diagnosis.—The physical characteristics of an early carcinoma of the cervix depend upon the variety of the growth and its point of origin. As the most common form is the squamous-celled variety arising from the vaginal surface of the cervix, it is usually plainly evident to inspection after exposing the cervical lips. Its appearance is suggestive of the ordinary cervical erosion or eversion of the cervical lips, but it has certain points of variation from a benign eversion or erosion which may be brought out by a closer examination.



Max Brödel, Lec.

FIG. 336.—Histological section of finger-like projection from cervix, showing cause of hemorrhage; (a) indicates a delicate capillary, which is surrounded by from two to three layers of squamous epithelium, and appears in a cross section of a typical finger-like outgrowth. At (b) is a finger of tissue containing two blood-vessels, or possibly two sections of the same vessel, if it has been a very tortuous one. (c) is a large blood-vessel. Note the very fragile walls, consisting of a layer of endothelium (d) and external to this a few young connective tissue cells. Covering the surface of this vessel are a varying number of layers of squamous cells; at (e) three or four layers, the one next the vessel being cuboidal; at (f) only one layer. (g) indicates solid areas, rich in epithelial cells. In some places blood-vessels are scattered sparingly throughout them. (h) indicates cell nests, which render the diagnosis of squamous cell carcinoma fairly easy; (i) is a stroma of the growth, very scanty in amount, and consisting of a few spindle-shaped cells, but, principally of small round cells. At point (j) in the large vessel (c) is a clump of polymorphonuclear leucocytes. The entire picture bears a striking resemblance to angiosarcoma, more especially the area enclosed by (h). (Cullen's Cancer of the Uterus, W. B. Saunders Co.).

In a benign erosion or eversion of the cervical lips the exposed mucosa of the cervical canal, even though hypertrophied, preserves the regular arrangement of its folds. In carcinoma the surface is covered with finger-like projections which have no regularity of arrangement. The mucous membrane in a benign erosion is frequently covered by a clear mucus. The finger-like projections of a carcinoma are usually matted together by a blood-tinged mucus. If each lip of an everted cervix is caught with a tenaculum and approximated at the position of the external os, the eversion of the mucous membrane will be corrected and the suspicious area will be rolled into the cervical canal. An attempt to do this, in the presence of carcinoma, will fail. Palpation of an everted mucosa reveals a soft, velvety surface which does not bleed upon gentle palpation, while palpation of a carcinomatous surface reveals an indurated, friable tissue, and results in considerable bleeding. Induration of the cervical tissue surrounding the suspicious area is more apt to be found in carcinoma than in a benign condition. In doubtful cases, by using a small curette, it will be found that a carcinomatous area is very friable and may be scraped away easily, whereas, in a benign erosion, the tissue does not show the same tendency to be broken up and scraped away. In every case, irrespective of the clinical findings, recourse should be had to excision of the suspected area and microscopic examination.

Carcinoma beginning within the cervical canal presents more difficulties in the way of an early diagnosis than does carcinoma of the vaginal surface of the cervix. In some instances the carcinomatous infiltration extends into the substance of the cervix with little external evidence of its existence upon the vaginal surface. The cervix, in such cases, is harder than normal, and quite likely to be distinctly nodular. If the external os has been opened by a laceration or otherwise, the same finger-like projections may be observed within the cervical canal. Palpation of the cervix is likely to be followed by hemorrhage, and the introduction of a sound will almost invariably produce bleeding. By the introduction of a curette within the cervical canal it can be determined that the tissue is more friable than normal, and it may be possible, without using much force, to excavate an area of some size about the cervical canal, the tissue coming away in small pieces, like hard cheese.

Fortunately, carcinoma originating within the cervical canal is not as frequent as carcinoma beginning upon the vaginal surface, and as carcinoma of the cervix is usually found in a lacerated cervix, the cervical canal is more accessible than in a nulliparous woman, or if no laceration existed. In every doubtful case recourse must be had immediately to curettement and excision of a portion of the cervical lips, with subsequent microscopic examination. Carcinoma of the cervix in the early stage may appear as a small ulcer. Ulceration and excavation of a carcinomatous area do not occur, as a rule, except in well-developed cases, but occasionally a beginning new growth may appear as a small ulcer with indurated base and irregular margins bleeding freely upon palpation. Unless it is very superficial an actual ulceration of the cervix is commonly malignant.

The clinical forms of early carcinoma above described may be confused with

sarcoma, syphilis, or tuberculosis of the cervix. The distinction between them can be made positively only by means of a microscopic examination.

Cervical polyps and submucous pedunculated myomata projecting from the external os may be mistaken at first sight for cervical carcinoma. A careful examination, however, will show at once that the tumors lie within the cervical canal and are attached by a pedicle to a point above the internal os. As cervical polyps not infrequently undergo malignant degeneration, and as 9 per cent. of submucous myomata become sarcomatous, the indication in both instances is immediate operation—avulsion and curettement—and microscopic examination of the specimens.

Treatment.—The treatment of carcinoma of the cervix, to be of any avail, must be carried out, as a rule, in the early stage. If a carcinoma has over-spread the limits of the cervix, the case is hopeless, with few exceptions, whether treated by operation or otherwise. Even in some very early cases, by the time the patient is exposed to surgical treatment, metastasis to some of the pelvic glands has occurred, and operation does not permanently cure. It is, therefore, of the *utmost importance* that *cases should be recognized at the earliest possible moment*.

The operation for carcinoma of the cervix consists of a panhysterectomy in which the entire uterus and the adnexa are removed, together with the vaginal vault, and the paracervical and the upper paravaginal connective tissue (Fig. 344). In addition to the removal of these structures, in certain cases it will be found advisable to remove enlarged pelvic lymph-glands; as a rule, however, if there is any glandular involvement, the disease will return, no matter how extensive the operation. The reason for adopting as wide an excision of the diseased cervix as possible is that a carcinoma of the cervix frequently has microscopic extensions about it which are not recognizable grossly, so that, although macroscopically the disease may appear strictly limited to the cervix, there may be some small metastases in the structures surrounding it. For that reason the parts mentioned are removed with the uterus and the adnexa.

This is the most serious operation which the gynecologist is called upon to perform, the danger arising, in part, from the extensive dissection which is necessary, and which imperils the integrity of such structures as the rectum, the bladder, and the ureters. Furthermore, carcinoma is frequently the abode of the streptococcus, and the cellular tissue of the pelvis, exposed during operation, is a favorable nidus for the growth and extension of a streptococcus inflammation. Another remote danger which obtains in a radical operation for carcinoma is that pieces of carcinomatous tissue which are broken off during the operation may be implanted in the operative area and subsequently developed there.

For all these reasons, certain steps are taken to sterilize the carcinomatous area, as far as possible, before operation, and to prevent the carcinomatous tissue itself from coming in contact with the operative field.

In stout women, or in those in whom, for general reasons, an extensive abdominal operation would be either very dangerous or very difficult, a

vaginal hysterectomy may be substituted for the abdominal operation. This may be aided by what is known as a paravaginal incision (Fig. 346) if the perineum is rigid, or done without it if the patient has a roomy vaginal introitus and the cervix is easily exposed. The preparatory treatment is the same for all forms of operation. Under nitrous oxide-oxygen anæsthesia, all friable tissue in the carcinomatous area should be removed, and the base of the excavation remaining cauterized, with a thermo- or electric cautery.

If an abdominal hysterectomy is to be performed, the vagina is then thoroughly washed out with a solution of bichloride, 1 : 2000, and packed with bichloride gauze.

In the event of a vaginal hysterectomy, after cauterizing the carcinomatous area and using the cautery, the vaginal wall is circumcised a short distance below the cervix, and a cuff of vaginal tissue turned over the projecting cervix and united with sutures; in this way the carcinoma is effectually closed off from the operative field (see also Chapter XL for the use of radium in the preparatory treatment).

Prognosis.—The prognosis in carcinoma of the cervix is bad, unless the case is discovered in its incipency. At the present time scarcely more than 40 per cent. of cases seeking surgical advice are operable—that is to say, are suitable for a radical operation, with the hope of removing all the carcinomatous disease. European operators give an average operability of 65 per cent.; American figures show only 35 per cent. of carcinomas in an operable condition. In nearly 60 per cent. of carcinomas a radical operation is impossible. In untreated cases death usually results in from twelve to eighteen months.

The best results in the treatment of carcinoma of the cervix show 20 to 25 per cent. of cures after five years; in other words, 20 to 25 out of 100 women with carcinoma of the cervix applying for treatment were cured by the radical operation. Of the cases which survived the operation, 45 to 55 per cent. remained cured for more than five years. These statistics may be improved by constant watchfulness on the part of the physician in order to detect carcinoma in its earliest stage. For this reason, in all suspicious cases, the physician should satisfy himself as to the true nature of the affection by at once preparing sections for histological examination.

The Question of Operability.—What is there to guide the surgeon in determining which cases are operable and which are inoperable? As a rule, when the carcinomatous area has not encroached upon the vaginal vault, or is separated from it by a rim of healthy tissue, and there is no fixation of the cervix, or induration at the base of the broad ligaments, the carcinoma is limited, and there is good hope of removing it by a radical operation; such cases are operable.

If the carcinoma has destroyed the cervix, or involved its entire extent, or spread to the vaginal vault, and if, in addition, the bases of the broad ligaments are indurated, and the uterus is fixed, such a case is not amenable to the radical operation and may be classed as inoperable. There are certain border-line cases in which it will be impossible to say, without an examina-

tion under anæsthesia, or even without an exploratory laparotomy, whether there is any hope of curing the patient by a radical operation. Induration along the sides of the cervix is not always due to extension of the carcinomatous process, but may be simply an inflammatory reaction and infiltration. On the other hand, carcinoma may have extended beyond the cervix into the broad ligaments without giving rise to much induration, or it may have given glandular metastasis before any induration or fixation of the uterus, or broad ligaments, is demonstrable.

If one is convinced that the carcinoma has extended beyond the confines of the cervix or there are any glandular enlargements, it is good practice to take the position that the case is hopeless, unless it can be influenced by radium and that a radical operation is unjustifiable. In some cases in which one is in doubt, an exploratory incision may be made and one may decide by what he finds whether to go ahead with the radical plan or not. Cystoscopic examination is sometimes of considerable value in determining whether there is involvement of the bladder. Cases in which the bladder wall is involved almost invariably show bullous œdema and some retraction or contraction of the vesical base.

Treatment of Inoperable Cases.—A new hope may be offered to patients suffering with inoperable cancer in the use of radium. If this precious element is available, it gives the best promise of relief and sometimes causes the tumor to disappear even in advanced cases. Our experience with radium is still too recent to speak much of "cures." All we can say now is that in some patients after the use of radium the growth disappears and the patients are free from symptoms—in the oldest case on record for a period of seven years. An application of radium is the least disturbing and painful of any method of healing inoperable cases. All that is required is to place the radium in the diseased area and leave it there for a certain number of hours. (For the statistics, dose, and technic, see Radium and Röntgen Ray Therapy, Chapter XL.)

If radium is not available, then the cold cautery method of Percy should be used. This method depends upon the assumption, apparently a fact, that a certain degree of heat, short of scorching or burning, will cause the disintegration of cancer cells while it does not exert a deleterious influence on normal tissue. Percy has devised instruments and elaborated the technic of this method of treatment. The principle of his operation is to thrust a "cold" cautery iron into the midst of the carcinomatous area and then by gradual radiation to influence not only the cancer cells immediately in contact with the iron, but also those at a distance. This requires time, and it is not unusual to leave the iron in position for two hours. In addition to cautery irons Percy has devised various water-cooled specula, which are used for the protection of the surrounding areas.

Combined with the cold cautery the ligation of the arteries which supply the uterus and pelvic viscera with blood has a further favorable influence. When the blood supply is shut off from the diseased areas they are more

inclined to disintegration. To this end, as a preliminary to the application of the "cold cautery," the internal iliac, ovarian, and round ligament arteries are tied with non-absorbable ligatures.

This method is not devoid of danger. Percy has recently published his mortality rate which shows that there have been deaths directly following the use of his plan. It must be remembered, however, that all such cases are poor operative risks and that if let alone death would be inevitable. (See technic of Percy method, page 356.)

If neither radium nor the Percy method is available, then the hope of a cure must be abandoned, but the relief of certain symptoms, such as fetid discharge, hemorrhage, and pain may be secured by a very thorough curettement of the carcinomatous area and subsequent cauterization; for this either the actual cautery or a chemical solution, such as saturated chloride of zinc, 10 per cent. formalin, or pure acetone may be employed. The application should be made to the carcinomatous crater by means of small pledgets of cotton which have been pressed out of the solution. The vaginal wall and the surrounding healthy tissue should be protected by a thick application of boric ointment. The cotton pledgets are removed at the end of forty-eight hours, after which douches of permanganate of potassium, 1:5000, or lysol, $\frac{1}{4}$ of 1 per cent., may be given to keep the parts clean and reduce the odor.

For the relief of pain an opiate will ultimately be required. It is best to begin with codeine or heroin and later use morphine itself.

Recurrence of Carcinoma after Operation.—Recurrence of carcinoma following radical operations for the removal of the uterus is found in approximately 45 per cent. of carcinoma of the cervix. The majority of the recurrences take place during the first year. Recurrence may be due to implantation metastasis or the incomplete removal of the carcinomatous tissue, especially in the vaginal vault, parametrium, and the lymph-glands. Involvement of the parametrium recognizable at the time of the operation has been followed by recurrence in many cases.

Clinical indications of a recurrence are beginning cachexia with persistent and localized pain. In the majority of cases the recurrence takes place in the hypogastric or iliac lymph-glands. These form an irregular mass spread out upon the surface of the pelvic bones, often best palpable through the rectum. Recurrence in some instances may not take place until after the assumed limit of cure of five years has elapsed.

A decrease in the frequency of recurrence is dependent upon earlier recognition and operative treatment, as well as perfection in the technic of the operation.

CARCINOMA OF THE BODY OF THE UTERUS

Pathology.—Carcinoma of the body of the uterus, as a rule, occurs later in life than carcinoma of the cervix. It is even more insidious than cervical cancer, and affects women who have not borne children as much as those

who have. Fibroid tumor of the uterus is complicated by cancer of the uterine body in 1.54 per cent. of the cases. Stone has called attention to what he terms precancerous changes in the uterus. Under this designation he includes, in addition to myomata, leucoplakia, uterine polyps, and glandular hypertrophy. Although usually of the glandular type, springing from the cylindrical epithelium of the endometrial surface, or the glands (Figs. 337 and 338), it also may be, though rarely, of the squamous-celled variety, the surface epithelium having undergone a metaplastic change before the beginning of the carcinoma.

Carcinoma of the body of the uterus has a tendency to invade the uterine wall and to extend throughout the entire endometrium. In the late stage it may perforate the wall of the uterus and involve the peritoneal surface or the parametrium, or it may extend down beyond the confines of the internal os and involve the cervix. It usually requires some time before this degree of extension takes place. Carcinoma of the body of the uterus has been regarded as little disposed to give metastasis, except in the late stages; according to Weibel, lymphatic involvement is more frequent and when it occurs the metastasis is usually to the lumbar and iliac glands, or general metastasis may take place. Metastasis of carcinoma of the body of the uterus, in late cases, may also invade the inguinal glands through the lymphatics of the round ligaments. The adnexa are sometimes the seat of metastasis, even when the uterus is small and the carcinoma not very extensive. The adnexal lesion may sometimes overshadow the uterine lesion in its clinical manifestations.

Symptoms.—There are no pathognomic symptoms of cancer of the fundus. The most frequent early symptom is irregular hemorrhage or a leucorrhœal discharge. The hemorrhage is intermenstrual, and varies from a mere show to a brisk hemorrhage. It is brought on by exertion or by some slight jolting or movement of the uterus. At first the hemorrhage may be regarded as an increase of the menstrual flow incident to the menopause. Very often the bleeding begins months or years after the menses have ceased; it is then a striking symptom and likely to attract attention.



FIG. 337.—Early carcinoma of the endometrium. Diagnosed from curettings. (Stetson Hospital.)

The leucorrhœal discharge is commonly thin, milky, and foul-smelling, and may suddenly appear as something entirely new, or gradually show itself as an exaggeration of a previously existing leucorrhœa. If hemorrhage and the leucorrhœal discharge begin after a woman has ceased to menstruate and has presumably passed the menopause, they are especially significant, and in a large majority of cases are indicative of malignant disease.



FIG. 338.—Advanced carcinoma of the endometrium and small interstitial myoma. The uterine cavity was filled with a necrotic putrid mass. The walls of the uterus at the area of the attachment of the tumor were destroyed almost to the peritoneal coat. (Gynecological Laboratory, U. of P.)

In the later stages, when the carcinoma has involved a good part of the uterine wall (Fig. 338), and necrosis of the carcinomatous tissue has begun, to those symptoms already mentioned will be added a more or less constant putrid discharge, and the symptom-complex known as cachexia.

Diagnosis.—A positive diagnosis is not possible in the early stages without the aid of digital or instrumental intrauterine exploration, supplemented in early or doubtful cases by a microscopic examination of endometrial scrapings. There may be very little enlargement of the uterus in a case of early carcinoma. Perhaps in a majority of early cases the uterus is not enlarged,

the disease frequently beginning after the menopause in women who have not borne children, so that the uterus may be entirely normal in size, or even small. Dilatation of the cervix, with curettement, is the diagnostic means *par excellence*.

The practised hand will often obtain positive information from curettage. This may reveal a roughness or thickness of the endometrium; the amount of tissue removed is commonly greatly in excess of that in a case of simple hypertrophy of the endometrium. It is whitish, like old cheese, in appearance, quite friable, and comes away in disconnected pieces rather than in long strips or ribbons. In any doubtful case the operator must wait until a microscopic examination of the curetted particles can be made. Every case diagnosed clinically as carcinoma must be confirmed by histologic examination. Serological and biological methods proposed in recent years for the diagnosis of carcinoma have not proved specific in a sufficient degree of accuracy to be accepted.

Treatment.—The treatment of carcinoma of the body of the uterus consists of panhysterectomy. Early cases, in which the entire uterus and the tubes and ovaries are removed, will almost invariably remain permanently cured. Even some of the later cases in which the carcinoma has advanced, almost but not entirely, through the muscular wall of the uterus, will be permanently cured by complete hysterectomy. Fortunately, in cancer of the fundus metastasis occurs later than in cancer of the cervix, and the disease does not eat its way through the uterine wall until far advanced.

Complete hysterectomy for cancer of the fundus may be done by the abdominal or by the vaginal route. There is no need for a wide resection of the vaginal vault or the base of the broad ligaments. The abdominal is preferable to the vaginal route unless the woman is excessively stout. In nulliparæ a paravaginal incision may be used to facilitate vaginal hysterectomy. If the uterine fundus is enlarged to any considerable extent, if it contains a fibroid tumor or tumors in addition to the cancer, if there are any adnexal complications, or if there are any intestinal or intra-abdominal symptoms which make abdominal exploration advisable, the vaginal route is unsatisfactory.

The treatment preparatory to hysterectomy for carcinoma of the fundus should consist of an application of the tincture of iodine to the interior of the uterus, the introduction of a tight uterine pack, and the closure of the cervix with several sutures. This preparatory treatment should immediately precede the radical operation, and is for the purpose of disinfecting and shutting off the carcinomatous growth from the operative area.

Advanced cases of carcinoma of the fundus which are not amenable to radical operation may be exposed to radium or the Röntgen ray (see Chapter XL).

Prognosis.—The prognosis of carcinoma of the fundus is much better than that of carcinoma of the cervix. While statistics vary and depend upon the stage of the disease and the technic of the operator, about 75 per cent. are cured.

SARCOMA OF THE UTERUS

Pathology.—Sarcoma may originate in the connective tissue of the cervix, or in the body of the uterus, or it may represent the transformation of a myoma of the uterus into a myosarcoma. Sarcoma of the cervix is rare, being most frequently found in infants or in young children, and likewise primary sarcoma of the body of the uterus is very rare; in a series of 3000 operative cases at the University Hospital, it has only occurred twice. The most frequent form of sarcoma of the uterus is the myosarcoma, a degeneration of the ordinary myoma. Primary sarcoma of the uterus may be of the round or spindle-celled type. Metastasis may take place to various organs, notably the lungs, liver, ovaries, and intestinal tract.

Symptoms.—Sarcoma of the cervix occurring in young children first draws attention to itself by the hemorrhage which it occasions and by the appearance of a purplish-red, grape-like mass at the vulvar orifice. It begins upon either the cervix or the vaginal vault, grows very rapidly, and even though it is removed by a radical operation, very few cases recover. Sarcoma in the adult, whether of the cervix or the body of the uterus, differs in no wise symptomatically from carcinoma.

Diagnosis.—The diagnosis of sarcoma of the cervix is justified clinically when a tumor having the characteristics mentioned appears in a young child or infant. A microscopic examination should be made for verification. In the adult, sarcoma of the cervix can only be positively distinguished from carcinoma by a microscopic examination, the symptoms, subjective and physical, being practically the same as those of carcinoma. Sarcoma of the fundus also exhibits exactly the same symptoms as carcinoma, and can be distinguished therefrom only by a histologic examination of scrapings.

Treatment.—Sarcoma developing in a myoma is usually not detected until a histological examination is made of the tumor after removal. It may, however, be suspected in a growth which has been quiescent for some time and then begins to increase rapidly in size; such a degeneration is especially frequent in submucous fibroids. The treatment of sarcoma of the uterus is the same as that of carcinoma. It must be detected at an early stage and subjected to a radical operation to ensure a favorable outcome.

CHORIOEPITHELIOMA

Pathology.—As its name implies, chorioepithelioma is a new growth originating in the epithelium of the chorion. It is the result of an irregular and abnormal proliferation of the chorion epithelium. The chorion epithelium normally possesses a destructive action which, early in pregnancy, assists in the formation of the placenta. As soon as the placenta is formed the destructive activity of the chorion epithelium ceases. This is almost certainly the result of specific antagonistic substances (syncytiolysins) circulating in the blood. Under certain circumstances the inhibitory action of the antibodies is too weak and the impulse of the chorion epithelium to

proliferate and destroy is unusually strong; it keeps on proliferating and destroying, becomes irregular and unlimited in growth, and constitutes a chorioepithelioma. Even after the development of a tumor mass the resistance of the individual may be so increased that the proliferating and destructive powers of the tumor become neutralized and it shrinks and disappears. If this fortunate increase in resistance does not occur, the growth is rapidly fatal.

While chorioepithelioma sometimes makes its appearance after normal pregnancy and labor (growing from masses of chorion epithelium embedded in the wall of the uterus at the placental site), as a rule, it follows an abortion. In this the foetus and the placenta may have exhibited no abnormalities; yet there often exists the evidence of some disease of the placenta; the most frequent being hydatidiform mole. While hydatidiform mole is by no means invariably followed by a chorioepithelioma, it certainly predis-

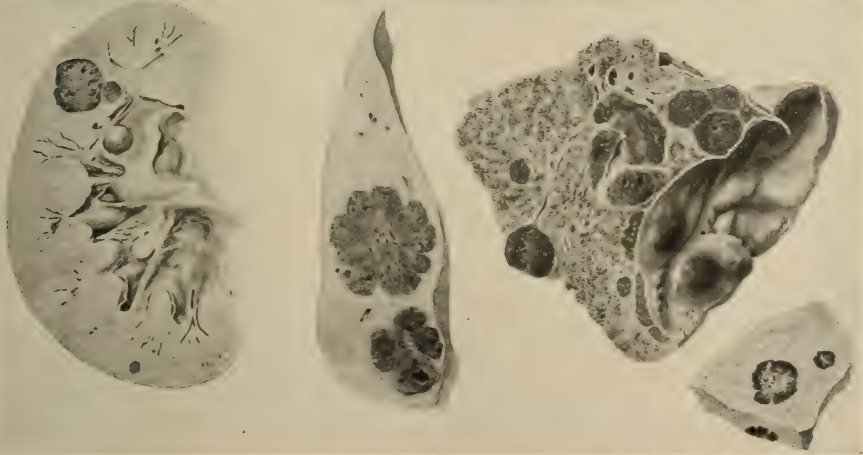


FIG. 340.—Metastases of chorioepithelioma in kidney, liver, lung and pancreas. (University Hospital.)

poses to the latter as can be gathered from the fact that about half of the cases of chorioepithelioma follow hydatidiform mole.

The proliferating chorioepithelioma eats its way into the muscle of the uterus, eroding blood-vessels, causing interstitial hemorrhage between the muscle fibers, and by its proliferation producing interstitial hæmatomata, with a definite enlargement, softening, and altered appearance of the affected part (Fig. 339, frontispiece). The proliferating cells quickly gain access to the blood stream and are deported to all parts of the body—brain, lungs, liver, kidneys, spleen, etc., where metastatic growths are set up having the same destructive properties as the original tumor (Fig. 340). Metastasis is followed shortly by death.

The original chorioepithelioma is always at the site of the chorion or placenta, and therefore in the uterus (uterine gestation) or in the tube (tubal gestation). In a few instances the original tumor has been cast off or

curetted away while the first recognized evidence of the disease has been a metastatic deposit. This is spoken of as "a chorioepithelioma outside the placental site;" it has been found most often in the vault of the vagina of which the rich venous plexuses favor metastasis.

It is interesting to note that in a fairly large number of cases of chorioepithelioma, as well as of hydatidiform mole, bilateral lutein-cell cystomata of the ovaries have been found. The size of such cystic ovaries varies; they have been observed as large as a foetal head. The cause of lutein cysts and the relationship between them and the chorioepithelial diseases are as yet unexplained.

Symptoms.—The symptoms of chorioepithelioma are hemorrhage and tumor. These develop shortly after the expulsion of an hydatidiform mole, abortion, or labor at term. Exceptionally a much longer time (several years) may intervene, or the disease may make its appearance in association with hydatidiform mole, even before the mole is discharged. Hemorrhage occurring several weeks after the uterus has discharged its pregnant content is always suggestive of hydatidiform mole. After hydatidiform mole symptoms such as described are especially likely to mean a chorioepithelioma. In a few cases a vaginal or a labial nodule or metastasis has attracted the attention of the patient to her condition. Sometimes she may be conscious of an enlargement of the uterus—abdominal tumor. The patient becomes rapidly anæmic; toxæmia from infection and necrosis of the tumor mass develop, evidences of metastasis—thoracic pain, cough, rusty sputum, etc.—appear, and the patient rapidly succumbs. Death may occur within a few months of the first appearance of symptoms.

Diagnosis.—Once the suspicion of chorioepithelioma is entertained, exploration of the uterus with diagnostic curettage and microscopic examination is immediately demanded. Metastatic nodules in the vagina and about the vulva which appear like varicosities or hæmatomata should be excised. The microscopic appearance of the uterine scrapings should be considered in connection with the clinical evidence. A tumor mass plus the characteristic appearance of chorioepithelioma is diagnostic. But the histological appearance of chorioepithelioma is so little different from the picture that might be furnished by a small portion of placenta and decidua attached to the uterine wall, that both clinical and microscopic evidence must be taken in making the diagnosis positive. Tissue which is taken from any other locality than the placental site and exhibits the histological appearance of chorioepithelioma is, of course, positively diagnostic.

Prognosis.—The prognosis, as a rule, is bad, but in the individual case it depends upon the stage at which the disease is detected. Even the incomplete removal of the tumor has been followed by recovery. When primary in the uterus the removal of the tumor has been followed by the spontaneous disappearance of metastatic growths. About 80 per cent. of cases of chorioepithelioma die within six months after the appearance of the tumor. In 188 cases collected from the literature with 99 radical operations, Teacher reports 63.6 per cent. of recoveries.

Treatment.—For chorioepithelioma of the uterus immediate panhysterectomy is indicated. The broad ligament should be excised to as great an extent as possible in order to get rid of veins containing metastatic particles. Vaginal and labial nodes should be taken out with a wide margin of healthy tissue. Radium may be used when it is evident that the diseased tissue has not been entirely removed, or the case has passed beyond the bounds of operability, or when there is a recurrence after operation.

OPERATIVE TECHNIC

Panhysterectomy for Malignant Tumors of the Cervix (Wertheim).—In performing a panhysterectomy for a malignant tumor, the diseased area must be prepared in such a manner as to get rid of the friable cancerous tissue, and to kill, as far as feasible, any bacteria which have found lodgment there. To accomplish this, the patient is placed in the dorsal position and, after the usual preliminaries, the diseased cervix is thoroughly cauterized, removing the exuberant carcinomatous tissue. The anterior and posterior lips of the cervix are united by catgut sutures over the carcinomatous area, if possible. Unless the disease is limited in extent, this cannot be done. The vagina is thoroughly washed with sterile water and bichloride solution, and a wet bichloride gauze pack is left in the vagina. The patient is then placed in the customary position for laparotomy, and after the usual preparations have been completed, a median incision is made from near the umbilicus to the symphysis, and the intestines are packed off from the pelvic cavity with a double layer of pads. The incision should be long enough to give ready access to the pelvis, and the patient should lie in an exaggerated Trendelenburg position while the pads are being introduced so as to isolate and expose the operative area to the greatest possible extent. The fundus of the uterus is now grasped with a forceps in order to afford a point of fixation, and the hysterectomy is started on one side. The infundibulo-pelvic and round ligaments are ligated close to the brim of the pelvis, and divided, reflex bleeding being prevented by forceps applied along the sides of the uterus. The broad ligament is divided to the outer side of the ovary and tube, and the anterior and posterior leaflets separated by blunt dissection down to the base of the broad ligament. The ureter adhering to the posterior leaflet, a little above and to the outer side of the uterosacral ligament, is now sought for. Some practice is required for the orientation of the ureter, but usually it can be found by palpation (Fig. 341); in very fat subjects this is facilitated by the preparatory intro-

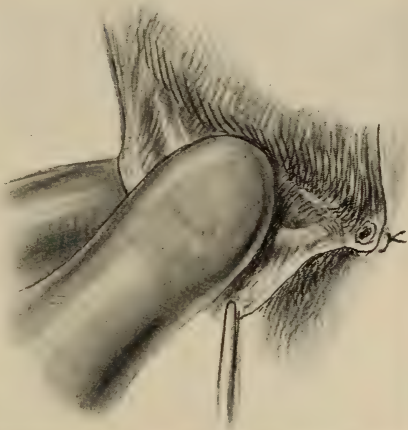


FIG. 341.—Panhysterectomy for carcinoma. After ligation of the ovarian (shown in picture) and round ligament arteries the leaves of the broad ligament are separated and the ureter recognized by rolling it between the thumb and first finger (right side).

duction of a ureteral catheter. After locating the ureter a loop of catgut is thrown about it (Fig. 342), and the free ends of the catgut knotted and left lying outside of the celiotomy incision. The incision through the anterior surface of the broad ligament is now continued through the vesical reflection of the peritoneum to the opposite side, where a similar dissection of the ureters is carried out. After exposing the ureters care should be taken to protect them, handling them as little as possible to avoid traumatism.



FIG. 342.—Passing loop of catgut about ureter; facilitates orientation during the operation.

By means of the catgut loops, the ureters may easily be exposed when desirable during the course of the operation. The finger is pushed through the base of the broad ligament from behind forward, along the upper surface of the ureter, picking up the uterine vessels and the cellular tissue of the base of the broad ligament; the uterine artery and veins are ligated as far out toward the pelvic wall as possible (Fig. 343). The same plan is carried out upon the opposite side. Both uterosacral ligaments are ligated and divided about one-quarter of an inch away

from the uterus, and the peritoneal incision on the posterior surface of the broad ligament is continued down over the anterior wall of Douglas' pouch to the opposite side. The bladder is pushed away from the anterior surface of the cervix, at first in the median line, and then at either side at the position of the ureters, so as to expose these structures entirely (Fig. 344). The parametrium is then separated from the pelvic wall and floor, on either side, the bleeding points being caught with long clamps and tied. This dissection is carried down into the cellular tissue surrounding the upper part of the vagina. At this stage of the operation the uterus with the adnexa, broad ligaments, parametrium, upper part of the vagina, and paracolpium, have been freed from the surrounding structures and are connected with the pelvis by the vaginal attachment only. The bichloride gauze pack in the vagina is now removed, and the vagina irrigated by an assistant. One right-angle clamp is applied to the vagina below the cervix, at least a half inch below the diseased area, as can be determined by palpation; another clamp is placed a quarter of an inch below the first (Fig. 345). The vagina is divided between the clamps by means of a cautery knife, and the diseased uterus with its attached broad ligament, cellular tissue, and vaginal cuff, is removed. Sutures are passed above the second clamp which close the vagina and insure hæmostasis. Such diseased glands remaining in the base of the pelvis as are palpable are dissected out. Bleeding points are caught with forceps and ligated, and the raw surfaces which have been exposed are covered with the vesical reflection of the peritoneum. Where the oozing from the divided capillary vessels is free and cannot be entirely controlled, a gauze wick may be placed to drain the subperitoneal space through the middle of the vaginal vault, but this drain should not be allowed to come in contact with the ureters.

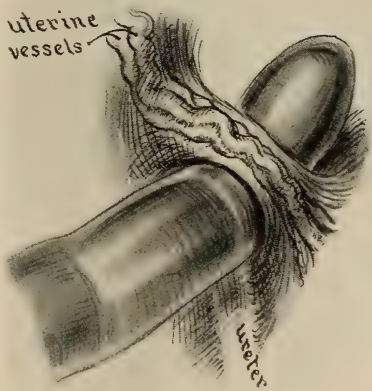


FIG. 343.—Ligation of uterine vessels. Vessels isolated on finger.

Vaginal Hysterectomy for Malignant Tumors of the Cervix (Simple).—

After the customary preliminary disinfection of the perineum and vagina, and the preparation of the carcinomatous area, the anterior and posterior lips of the cervix are united by sutures in such a way as to cover the cancerous crater, or, if that is impossible, the carcinomatous crater is packed with bichloride gauze and sewn over with sutures; or the vaginal fornices are circumcised about an inch from their reflexion to the cervix, and a cuff is turned over the diseased area. The bladder is separated from the anterior surface of the uterus, pushed up, and the vesicouterine fold of peritoneum incised. Douglas' pouch is opened by a posterior incision, the anterior and posterior incisions not meeting, but being separated by tissue at the sides of the cervix which contains the uterine vessels. The fundus of the uterus

is pulled into the vagina, the infundibulo-pelvic and round ligaments ligated on either side, provisional clamps placed along the borders of the uterus to prevent reflux bleeding, and the broad ligaments divided down to about the position of the uterine arteries (Fig. 347). At this point the operator makes sure that the base of the bladder and the ureters on either side have been separated from the uterus and are held out of the way by means of a long retractor. The base of the broad ligament is then ligated close to the uterus

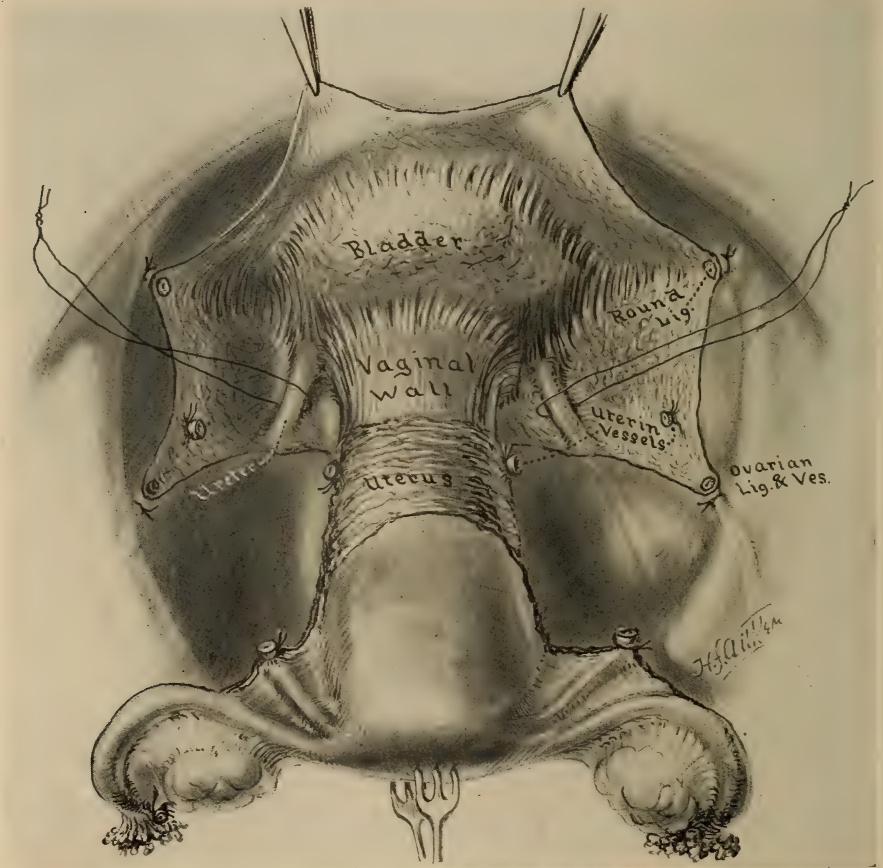


FIG. 344.—Dissection of bladder and ureters.

on either side, and the attachments which remain between the uterus and the base of the broad ligaments and the vagina are divided. The stump of the broad ligament on either side is drawn gently into the vault of the vagina and fixed in its corresponding angle by an extra suture. The anterior and the posterior peritoneal borders are united in the median line between the stumps of the broad ligaments. The vaginal vault is closed by interrupted or continuous sutures.

Vaginal Hysterectomy for Malignant Tumors of the Cervix with Para-

vaginal Incision.—Vaginal hysterectomy, according to the technic of Schauta, requires a very free exposure of the vaginal vault. As this is only practicable in relaxed multipara, he secures good exposure and easy access in other cases by dividing the levator ani muscle in one or both vaginal sulci (Fig. 346). The carcinomatous area is prepared by cauterization, and a cuff of the vaginal fornix is sewn over the diseased area. The operator separates the bladder from the cervix, and by careful dissection exposes the ureter, holds it out of the way, and isolates and divides the

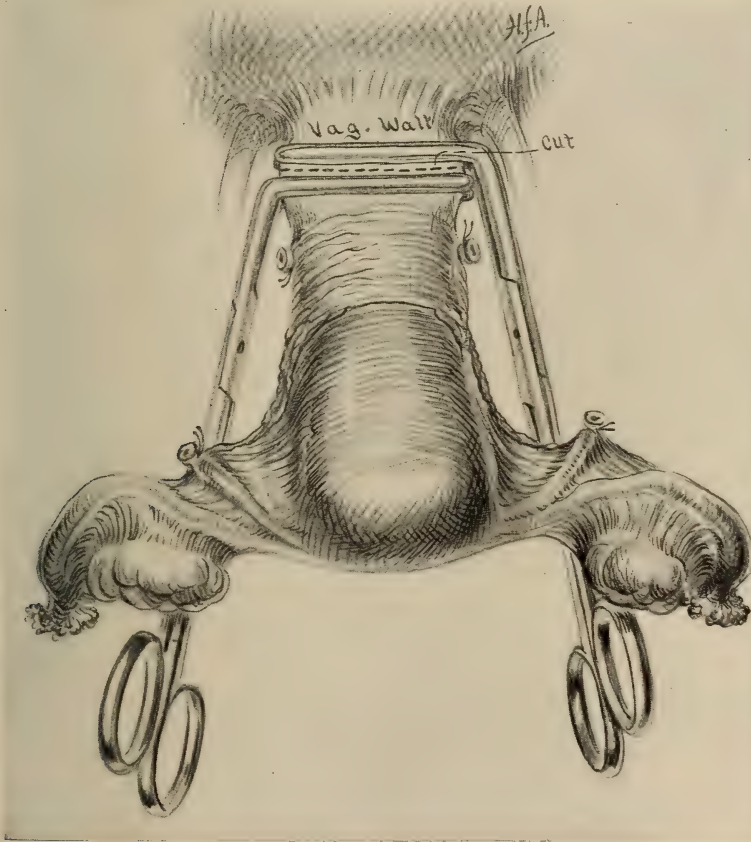


FIG. 345.—Application of clamps to vaginal wall.

uterine artery well out toward the pelvic wall. The fundus of the uterus is then anteverted through the vesico-uterine incision, and the ovarian and round ligament vessels securely ligated. The uterus is removed and the operation completed as has been described under simple vaginal hysterectomy. Drainage is usually employed.

Destructive Cauterization.—The carcinomatous tissue is destroyed with a cautery iron heated to a cherry red. A cutting blade is used at first, in order to remove exuberant masses. Thereafter, a blunt iron is passed repeatedly over the carcinomatous area, thoroughly destroying all gross

vestiges of the disease. The prognosis depends, to some extent, upon the thoroughness with which this is done. Care must be taken lest perforation of adjacent organs—bladder, rectum—take place, or the peritoneal cavity be invaded. The burned area is then packed with pledgets of cotton saturated with acetone, and the vaginal vault and the vagina are filled with gauze impregnated with sterile oil.

High Amputation for Malignant Tumors of the Cervix with a Cautery Knife.—In very early cancers of the vaginal cervix (squamous-celled carcinoma, epithelioma), which are limited to the vicinity of the external os, high amputation of the cervical lips with a cautery knife may be as

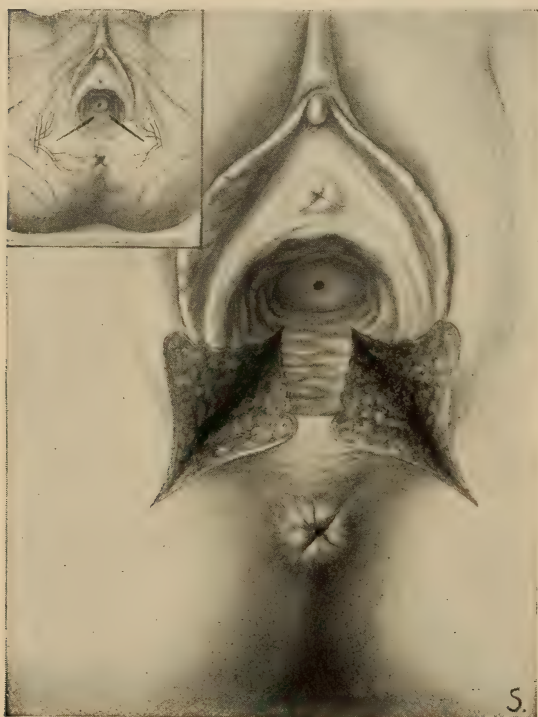


FIG. 346.—Paravaginal incisions (after Ward, *Surgery, Gynecology and Obstetrics*).

effectual as any form of operation. After a preparatory cauterization, the cervix is firmly grasped with a diverging volsellum in the canal and pulled down, and with a cautery knife, heated to a cherry red, the attachments of the vaginal fornices to the cervix, well outside the limits of the new growth, are slowly divided. The bladder is separated from the anterior surface of the cervix as far as possible, and the vaginal fornices are pushed away posteriorly, up to the peritoneal reflection of Douglas' pouch. The lips of the cervix are now amputated by means of a cautery knife, and the cervical canal thoroughly cauterized. By guiding the knife blade upward and inward, a large amount of the uterine body may be included in the amputation. The wound is allowed to heal by granulation.

In using the cautery knife in vascular areas care should be taken that it is cold when applied to the tissues and heated to a cherry red when in action; it should be allowed to cool before changing its position or reapplying. The reason for this is that if the knife, though heated only to a dull red, be applied to parts at all vascular more or less hemorrhage will follow, whereas if the cool platinum blade is already in contact with the tissues as the current is being transformed into heat, the vessels are shrunk or closed before they are severed.

Percy Method.—Percy objects strongly to his treatment being classed as a cauterization because when the word cautery is used the average person gets an entirely wrong impression of the object to be attained. To the

novice in the application of this technic, one of the surprises is the slowness with which the heat penetrates the cancer mass; it requires from twenty to forty minutes before an appreciable degree of heat is felt in the involved organs. This frequently leads the operator, unfamiliar with the proper way of applying the technic, to turn on more heat, which merely causes charring

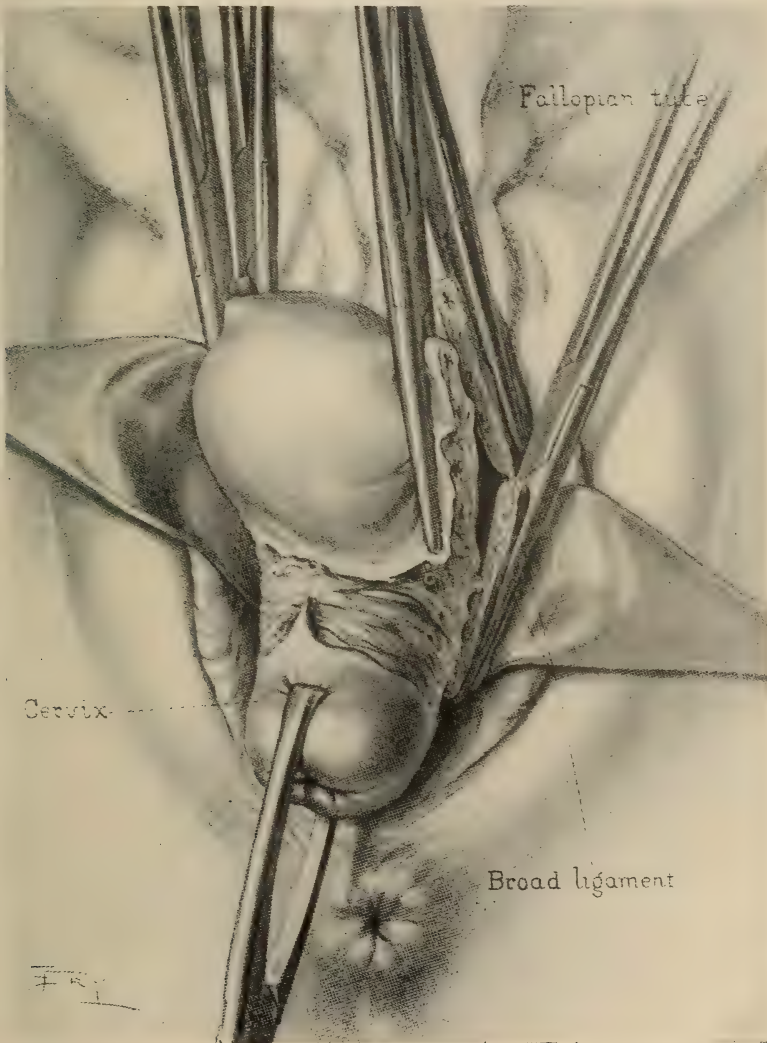


FIG. 347.—Vaginal hysterectomy. Application of clamps to broad ligament (Mayo, Surgery, Gynecology and Obstetrics).

of the tissues and the formation of a carbon core which does not transmit the heat well; then more heat is turned on until the degree of heat reaches a dangerous point. In order to illustrate the proper degree of heat to be used, Percy states that when cotton is wrapped around the heated cautery, it should not even change color. The curette should never be used before apply-

ing the treatment, even to get a portion of the diseased tissue for diagnostic purposes; when the tissues are thoroughly permeated by the heat, the cells are fixed in such a way as to become immediately available for sectioning and staining without the use of the usual hardening fluids. At the same time, the heat at once seals the lymphatic and blood-vessels, preventing the further dissemination of the cancer and mixed infection. In addition, the immediate nerve supply is cut off; this explains the freedom from shock and local pain which is the rule following this treatment. It is not a part of the technic to remove any of the pelvic structures which are the seat of cancer. The exception to this statement is that both ovaries are removed; first, to limit the blood supply, and secondly, to bring on the menopause where it has not yet occurred. If this is not done, a torturing form of menstruation may occur for a few periods because of the cervical stenosis which occasionally follows the application of the heat. The most distressing class of cases to treat are those in which recurrences follow a panhysterectomy, because in these there is no exuberant mass to use as kindling to develop heat. When recurrence follows a total hysterectomy, it is usually of the infiltrating type and the invaded tissues left after the hysterectomy are not of sufficient thickness to permit of the development of a degree of heat necessary to kill the carcinoma cells. As a cauterizing temperature cannot be regulated it has a distressingly destructive effect which will probably obliterate the most important part of the urethra or make a hole in the bladder. In order to overcome this difficulty caused by lack of tissue in recurrent cases, Percy has tried filling the vagina with a tightly bound mass of beef, in which a hole has been made with an apple corer for the heating iron. In this way he has succeeded very well in irradiating heat through the vaginal walls to a degree that is destructive to the cancer cells.

Technic.—The technic of the treatment as practised by Percy may be briefly outlined as follows: The abdomen is opened, the extent of metastases determined, and the internal iliac arteries ligated, after packing off the intestines, or, if this is difficult to do, the uterine arteries are ligated as near the pelvic wall as possible. When high degrees of heat are used, late hemorrhages are rare, but with the low degrees of heat used in this method, they become more frequent. It is an advantage, therefore, to tie off all the pelvic blood supply in order to aid in the starvation of the tissues which might otherwise become involved in the malignant process. This is accomplished by ligating the internal iliac arteries and removing the ovaries. Since doing this, Percy has had no hemorrhages, whereas before this became a part of his technic, hemorrhages occurred in 2.5 per cent. of his cases, usually about two weeks after the operation, and were responsible for the death of four patients. The vagina is then dilated and a water-cooled speculum inserted. The heating iron is introduced through the speculum to the fundus of the uterus and held there until everything abnormal is too hot to hold in the hand of the assistant, which is encased in a medium weight rubber glove. If the heating iron is moved aimlessly about, no area will become sufficiently heated to destroy the carcinoma. After the heat has penetrated the uterus to the desired degree, the heating iron is moved to a new position, and the procedure repeated. This is continued until all the

pelvic tissues are freely movable, the complete séance sometimes lasting several hours; but during this time the patient requires only the very lightest anæsthesia.

After the treatment there is usually an offensive discharge lasting about two weeks, and uterovesical and uterorectal fistulæ occasionally result from the treatment, but they usually heal spontaneously. At times, however, when the fistula is in the vagina, it is a difficult matter to secure closure. In about 50 per cent. of the cases a reapplication of the heat is necessary. In two cases Percy has repeated the treatment five times. The abdomen must be opened at each application and the hand inserted in order to determine the amount of heat required. Percy insists that a secondary radical operation should not be performed even if the case seems to be operable, as nothing is to be gained thereby, but, on the contrary, the cicatricial tissue is broken down and may be the starting-point of a recurrence, inasmuch as nature's defense is removed. "It must be remembered that the majority of the cases which Percy has treated are of the utterly hopeless type, most of whom have been refused operation by other surgeons, so that a cure in any of them is of great significance" (Clark, J. G., "Progressive Medicine," 1916, p. 215).

BIBLIOGRAPHY

- ANSPACH, B. M.: "The Value of Histological Examinations in Carcinoma of the Uterus." *Proceedings Phila. Co. Med. Soc.*, Dec., 1903.
- BAISCH: "Der Werth der Drüsenausräumung bei der Operation des Uteruscarcinoms." *Arch. f. Gynäk.*, lxxv, 273.
- BALFOUR, D. C.: "The Relative Merits of the Operations for Cancer of the Uterus." *S., G. & O.*, 1916, xxii, 74.
- BARTH, C.: "Die Prognostische Bedeutung Bakteriologischer Untersuchungen bei Abdominalen Uterus extirpationen wegen Carcinom." *Arch. f. Gyn.*, 1909, lxxxvii, 350.
- BEHLA, R.: "Ueber Beziehungen Zwischen Wasser und Krebs." *Zeitschr. f. Krebsforsch.*, 1907, v, 137.
- BERKLEY, C., AND BONNEY, V.: "The Radical Abdominal Operation for Carcinoma of the Cervix Uteri." *Brit. Med. Jour.*, 1916, ii, 445.
- BLAND, P. B.: "Chorioepithelioma Malignum." *J. A. M. A.*, June 10, 1905.
- BYRNE, J.: "Rules to be Observed in Performing High Amputation and Other Operative Measures for Cancer of the Uterus by Galvano-Cautery." *Brooklyn Med. Jour.*, 1892, vi, 760-766; *Ibid.*: "Vaginal Hysterectomy and High Amputation or Partial Extirpation by Galvano-Cautery in Cancer or Cervix Uteri—An Inquiry Into Their Relative Merits." *Brooklyn Med. Jour.*, 1892, vi, 729-760.
- CATURANI, M.: "Hydatidiform Mole and Chorionepithelioma." *Amer. Jour. Obst.*, 1917, lxxv, 591.
- CLARK, J. G.: "A More Radical Method of Performing Hysterectomy for Cancer of the Uterus." *J. H. H. Bull.*, 1895, No. 52-53; *Ibid.*: "Education of the Public Concerning Cancer of the Uterus." *Penna. Med. Jour.*, 1909, Nov., 113.
- CLARK, PETERSON, TAYLOR, TAUSSIG, CULLEN: "Symposium on the Result of Radical Operations for Cancer of the Uterus." *Trans. Amer. Gyn. Soc.*, 1912, 37.
- COUNCILMAN, W. T.: "Some General Considerations Regarding Tumors." *Boston Med. and Surg. Jour.*, 1907, clvii, 313.
- CULLEN: *Cancer of the Uterus*. D. Appleton, New York, 1900.
- FREUND: "Zu Meiner Methode der Totalen Uterus-extirpation." *Cent. f. Gyn.*, 1878, No. 12.
- GAYLORD, H. R.: "Etiology of Cancer in the Light of Recent Cancer Research." *J. A. M. A.*, 1915, lxiv, 968; *Ibid.*: "The Clinical Course of Cancer in the Light of Cancer Research." *Trans. Amer. Gyn. Soc.*, 1916, 41, 404.
- GELLHORN, G.: "The Treatment of Inoperable Cancer of the Uterus." *Amer. Jour. Obst.*, 1909, lx, 799.
- ISRAEL: "Die Probleme der Krebsätiologie." *Arch. f. Klin. Chirurgie*, Bd. lxxvii.
- JACOBSON, J. H.: "Recent Progress in the Treatment of Uterine Cancer." *J. A. M. A.*, 1916, lxxvii, 1219.

- KUNDRAT: "Ueber die Ausbreitung des Carcinoms in Parametranen Gewebe bie Krebs des Collum Uteri." Arch. f. Gynäk., lxix.
- LADINSKI, L. J.: "Complete Removal of Adenocarcinoma of Uterus by Exploratory Curettage." S., G. and O., 1915, xx, 325.
- LEYDEN, v.: "Ueber die Parasitäre Theorie in der Aetiologie der Krebse." Berlin, Klin. Wochenschr., xlii, No. 13.
- MACKENRODT: "Ergebnisse des Abdominalen Radikaloperation des Gebärmutter-scheidenkrebses Mittels Laparotomia Hypogastrica." Zeit. f. Geb. u. Gyn., 1905, liv, 514; *Ibid.*: "Weitere Mitteilungen zur Abdominalin Radikaloperation bei Uteruskarzinom." Centralbl. f. Gyn., 1909, No. 17, 593.
- MARCHAND, F.: "Ueber die Sogenannten 'Deciduales' Geschwülste im Anschluss an Normale Geburt, Abort., Blasenmole und Extrauterinschwangerschaft." M. f. G. u. G., 1895, I, 418-513.
- MARKOWSKY, A.: "Der Wert der Radikaloperationen der Kollumkrebs nach den Letzten Wertheim'schen Angaben im Lichte der Kritik." Monatschr. f. Geb. u. Gyn., 1912, xxxv, 715.
- MAYO, WM. J.: "The Cancer Problem." Jour. Lancet, 1915, xxxv, 339.
- OFFERGELD, H.: "Ueber die Metastasierung des Uteruskarzinoms in das Zentralnervensystem und die Höheren Sinnesorgane." Zeit. f. Geb. u. Gyn., 1908, lxiii, 1; *Ibid.*: "Die Beitung des Hämatopoetischen Systemes an der Metastaseierung beim Uteruskarzinom." Zeit. f. Geburts. u. Gyn., 1908, lxiii, 217; *Ibid.*: "Die Metastasen in der Bauchhöhle beim Uteruscarcinom." Arch. f. Gyn., 1909, lxxxvii, 298; *Ibid.*: "Hautmetastasen beim Uteruskarzinom." Monats. f. G. u. G., 1909, xxix, 870.
- OTT, von.: "Vergleichende Schätzung der Verschiedenen Methoden der Chirurgischen Behandlung des Gebärmutterkrebses." Zentralbl. f. Gynäk., 1909, xxxiii 1391.
- PERCY, J. F.: "The Treatment of Inoperable Carcinoma of the Uterus by Application of Heat." S., G. and O., 1914, xix, 636; *Ibid.*: "The Technic of Applying Heat in the Treatment of Inoperable Uterine Carcinoma." Amer. Jour. Obst., 1915, lxxii, 298; *Ibid.*: "The End Results of the Treatment of Inoperable Uterine Cancer by Heat." Amer. Jour. Obst., 1918, lxxvii, 93; *Ibid.*: "The Problem of Heat as a Method of Treatment in Inoperable Uterine Cancer." Trans. Amer. Gyn. Soc., 1916, 41, 542.
- PETERSON, R.: "The Extended Operation for Carcinoma of the Uterus." S., G. and O., 1916, xxiii, 237.
- REYNOLDS, E.: "The Newer Views of 'Cancer' and Their Present Relations to the 'Responsibility' of the Practitioner." Boston Med. and Surg. Jour., 1915, clxxiii, 75.
- RIBBERT: Das Karzinom des Menschen: Sein Bau, Sein Wachsthum, Seine Entstehung. Bonn, 1911.
- RIES: "Eine Neue Operationsmethode des Uteruscarcinoma." Zeit. f. Geb. u. Gyn., 1895.
- RIES, E.: "Theoretical and Practical Foundations of a Radical operation for Carcinoma of the Cervix Uteri." Trans. Sect. O. G. and A. S.—A. M. A., 1913, p. 164.
- SAMPSON, J. M.: "The Invasion of Carcinoma Cervicis Uteri into the Surrounding Tissues." J. A. M. A., Oct. 29, 1904.
- SÄNGER: "Ueber Deciduome." Cent. f. Gyn., 1889, xiii, 132.
- SCHAUTA, F.: "Die Erweiterte Vaginale Operationen bei Carcinoma Colli Uteri auf Grund Zehnjähriger Erfahrung." Monat. f. Geb. u. Gyn., 1911, xxxiii, 680; *Ibid.*: "Die Berechtigung der Vaginale Totalexstirpation bei Gebärmutter krebs." Monat. f. Geb. u. Gyn., 1904, xix.
- SCHOTTLAENDER U. KERMAUNER: "Zur Kenntniss des Uteruskarzinoms." Berlin, 1912.
- SCHUCHARDT: "Ueber die Paravaginale Methode der Exstirpation Uteri und Ihre Enderfolge beim Uteruskrebs." Monats. f. Geb. u. Gyn., 1901.
- STONE: "Precancerous Changes in the Uterus." Trans. Amer. Gyn. Soc., 1916, xli, 470.
- TEACHER, J. H.: "On Chorionepithelioma and the Occurrence of Chorionepitheliomatous and Mole-like Structures in Teratomata A Pathological and Clinical Study." Jour. Obst. and Gyn., Brit. Empire, 1913, iv, 145; *Ibid.*: "On Chorionepithelioma (the So-called Deciduoma Malignum) and the Occurrence of Chorionepitheliomatous and Hydatidiform-mole-like Structures in Tumors of the Testis." Trans. London Obst. Soc., 1903, xlv, 256.
- WEIBEL, W.: "Die Klinische Stellung des Carcinoma Corporis Uteri." Arch. f. Gyn., 1913, 135.
- WEIBEL, W.: "Weitere Beobachtungen über das Verhalten der Ureteren nach der Erweiterten Abdominalen Karzinomoperation." Zeitsch. f. Gyn. u. Urol., 1913, iv, 138.
- WERDER, X. O.: "The Byrne Operation and Its Application in the Radical Treatment of Cancer of the Uterus." Amer. Jour. of Obst., 1905, lii, 700.
- WERTHEIM: "Die Erweiterte Adominale Operation bei Carcinoma Colli Uteri." Berlin und Wien, 1911.

CHAPTER XIX

DISEASES OF THE FALLOPIAN TUBES

SALPINGITIS

Etiology.—Inflammation is the most frequent affection of the Fallopian tubes. Salpingitis is invariably caused by a bacterial infection. Mechanical, thermal, or chemical irritation may cause circulatory disturbance and tissue hypertrophy or atrophy, but not a true inflammation. The gonococcus is the organism which is especially prone to attack the tubes. Gonorrhœal salpingitis constitutes a very large part of tubal pathology.

Other organisms which may produce inflammatory lesions of the tubes are the streptococcus, staphylococcus, colon bacillus, and tubercle bacillus; and rarely also the pneumococcus, typhoid bacillus, and ray fungus. The infecting organisms reach the tubes (1) by extension upward from the endometrium along the mucosa (gonorrhœal endometritis), or (2) by extension



FIG. 348.—Acute gonorrhœal salpingitis, gross (Norris. *Gonorrhœa in Women*, W. B. Saunders Co.).

downward from the peritoneal cavity, through the open abdominal ostium (peritonitis, enteritis, appendicitis—tubercle bacillus, colon bacillus, streptococcus); (3) by extension from distant foci through the blood stream (tuberculosis—tubercle bacillus; typhoid fever—typhoid bacillus; actinomycosis—ray fungus); or (4) by direct extension through the peritoneal coat from adherent and diseased structures (ovaritis, cellulitis, peritonitis—streptococcus, staphylococcus, colon bacillus, etc.).

It is possible that streptococcus, staphylococcus, tubercle bacillus, and colon bacillus infections may extend along the mucous surface from the uterus into the tube, but such is not the rule. This is in direct contrast to gonorrhœal infection which almost invariably advances along the mucous surfaces. Streptococci, staphylococci, and colon bacilli are most apt to attack the tube from infected neighboring or adherent structures.

In the great majority of cases salpingitis is caused by the gonococcus, and next in order of frequency by the streptococcus, staphylococcus, colon bacillus, and tubercle bacillus.

Pathology.—Gonococcus infections attack primarily the mucosa (*endosalpingitis*) and lead to closure of the abdominal ostium, destruction of the

mucous plicæ, and distention of the tube with pus; streptococcus, staphylococcus, and colon bacillus infections attack primarily the outer serous coat (*perisalpingitis*) and may lead to adhesions, angulation, thickening, and infiltration of the tube wall (*interstitial salpingitis*), or even to closure of the abdominal ostium (*hydrosalpinx*), but they rarely produce *pyosalpinx* (Figs. 348 and 349). The infections caused by the streptococcus, staphylococcus, and colon bacillus are usually an extension from diseased and neighboring parts (metritis, cellulitis, ovaritis, peritonitis, appendicitis); the lesion is a perisalpingitis and the involvement of the tube is of secondary importance. Next to the gonococcus the tubercle bacillus is the most frequent cause of suppurative inflammation of the tubal mucosa. Tuberculous



FIG. 349.—Acute gonorrhoeal salpingitis. (Gynecological Laboratory, U. of P.)

salpingitis is marked by characteristic lesions which are dealt with in Chapter XXX (page 561).

In gonorrhoeal salpingitis, both tubes are affected in a large majority of cases. The disease in one tube, however, may slightly precede the infection of the other, so that the pathological change on one side may be further advanced or more marked than on the other side. Streptococcus, staphylococcus, and colon bacillus salpingitis are often unilateral.

Endosalpingitis.—In endosalpingitis the infection attacks the mucosa, the folds of which become congested and covered with pus. The tube wall becomes œdematous and thickened. The diameter and the length of the tube are increased. From a soft, almost impalpable structure it becomes indurated and well defined. On microscopic examination the stroma of the plica is found to be swollen, œdematous, and infiltrated with small round cells, polymorphonuclear leucocytes, and plasma cells; the surface epithelium is proliferated, swollen, imperfectly stained, and in many places detached from the stroma. The muscle and fibrous tissue of the tube wall are infiltrated with leucocytes; the lumen of the tube is filled with pus.

Perisalpingitis.—In this condition the infection attacks the outer surface of the tube, which becomes congested and adhesive; the peritoneum loses its glistening appearance, exudate is thrown out which binds the tube to neighboring structures, and the ovary and pelvic peritoneum are usually coincidentally involved. If the amount of exudate is large the abdominal ostium of the tube may be occluded.

Interstitial Salpingitis.—When the infection attacks the wall of the tube from within or from without, the condition is described as interstitial salpingitis. The muscular coats are œdematous and thick; there is a widespread infiltration with polymorphonuclear leucocytes; at certain points minute

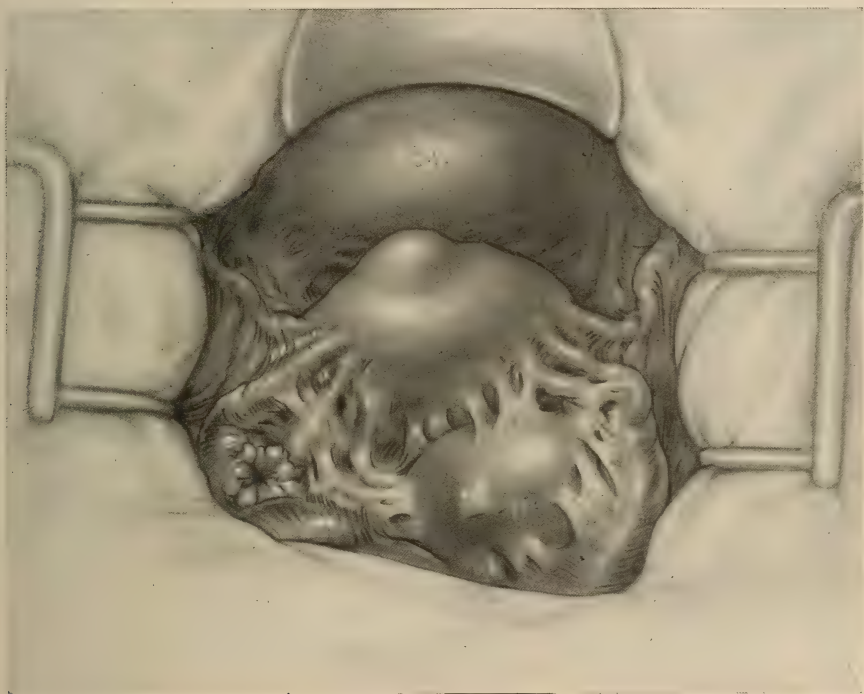


FIG. 350.—Uterus and appendages in extensive pelvic inflammatory disease exposed in the incision.

foci of suppuration may appear; later, as the acuteness of the condition subsides, there may be connective tissue hypertrophy about these minute foci. Irregular enlargement of the tube from intramural foci of suppuration is most frequent in the isthmic or interstitial part. To this condition the name *salpingitis isthmica nodosa* has been given. The disease may be limited to the area of enlargement. The middle and outer parts of the tube may appear quite normal.

End-results of Endosalpingitis.—The formation of pus in gonorrhœal endosalpingitis is free, and except in very mild cases is extruded in greater or less amount from the abdominal ostium of the tube upon the surface of the pelvic peritoneum. From this there results a localized pelvic peritonitis, more or less extensive, with the formation of exudate and inflammatory in-

filtration. As the result of the exudate, and the adhesions which form between the ostium of the inflamed tube and the pelvic peritoneum, by the time the inflammatory symptoms are abating, or even during their progress if the case is a severe one, the abdominal ostium of the tube becomes sealed, and the pus forming within, being no longer able to escape from the abdominal ostium, begins to distend the tube itself (Fig. 349). As the process goes on, the tubal plicæ may be destroyed to a great extent, the only part escaping destruction being the bases which are compressed and flattened against the wall of the tube by the purulent content, or the individual plicæ bereft of surface epithelium at certain points, become more or less exten-

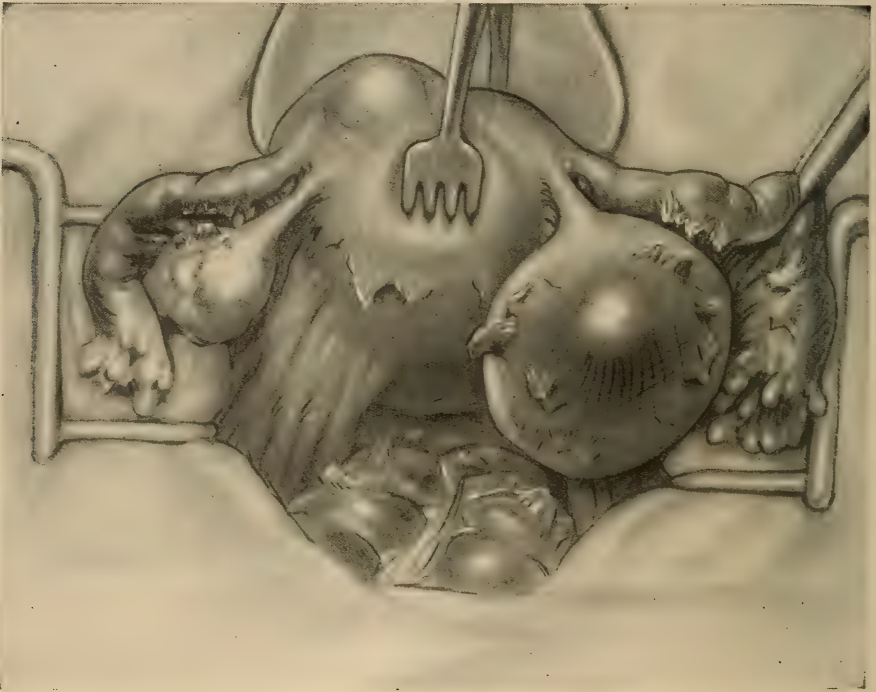


FIG. 351.—Uterus and appendages in extensive pelvic inflammatory disease; the adhesions divided, the parts mobilized and ready for extirpation.

sively adherent to each other, leaving between them completely isolated gland-like spaces representing remnants of the tube lumen.

Under rare circumstances the pent-up pus, after reaching a certain degree of compression, may be discharged through the uterine end of the tube into the cavity of the uterus. But this is not a frequent occurrence, for the infiltration of the tubal wall, the fixation and distortion of the tube which are incident to the inflammation, and the complicating peritonitis with adhesions and exudate, usually block the uterine extremity.

Pyosalpinx.—When the tube has become distended with pus, the resulting tubal enlargement is known as a pyosalpinx (Fig. 352). The tube by this time almost invariably has contracted adhesions to neighboring structures, has been pulled out of position, and has become variously distorted in

shape. It may vary in size from that of a finger to that of a sausage or a sweet potato. The wall may be quite thin when it is simply distended or overstretched, or quite thick when it has been invaded by the septic process.

The changes in the ovary which accompany endosalpingitis are the result of, and secondary to, the complicating pelvic peritonitis. The ovary itself is not primarily involved. The exudate thrown out by the inflamed peritoneum at first buries the ovary and later leads to adhesion or a permanent thickening of the ovarian capsule. A Graafian follicle or a fresh corpus luteum may become infected by the exudate and form an abscess.

If the endosalpingitis has been mild, and the peritoneal involvement slight, the inflammatory process may subside without a closure of the abdominal ostium or the formation of a pyosalpinx. But usually there are permanent residua of the disease, such as enlargement and distortion of the



FIG. 352.—Pyosalpinx and ovarian abscess. (Norris, *Gonorrhœa in Women*, W. B. Saunders Co.)

tube, adhesions, thickening of the plicæ, proliferation of the surface epithelium, and the formation of little pockets or cystic spaces in the mucosa brought about by the coalescence of the tips of neighboring folds. Though the gonococcus infection remains latent in the tubal mucosa or the endometrium, the patient may, and usually does, experience a repetition of the acute attacks. Repetition of the attack is usually precipitated by some trauma, such as rough examination, coitus, straining at stool, douching, etc.; the activity of the gonococcus is renewed; pus is again discharged from the abdominal ostium upon the peritoneum, and there is a fresh pelvic peritonitis. The destructive lesions become greater each time, so that finally the extreme changes (pyosalpinx, etc.) already noted may take place. The gonococci in the pus of a pyosalpinx may die in the course of several months, and a secondary infection with the colon bacillus or the streptococcus or the staphylococcus from neighboring or adherent intestines may take place, but

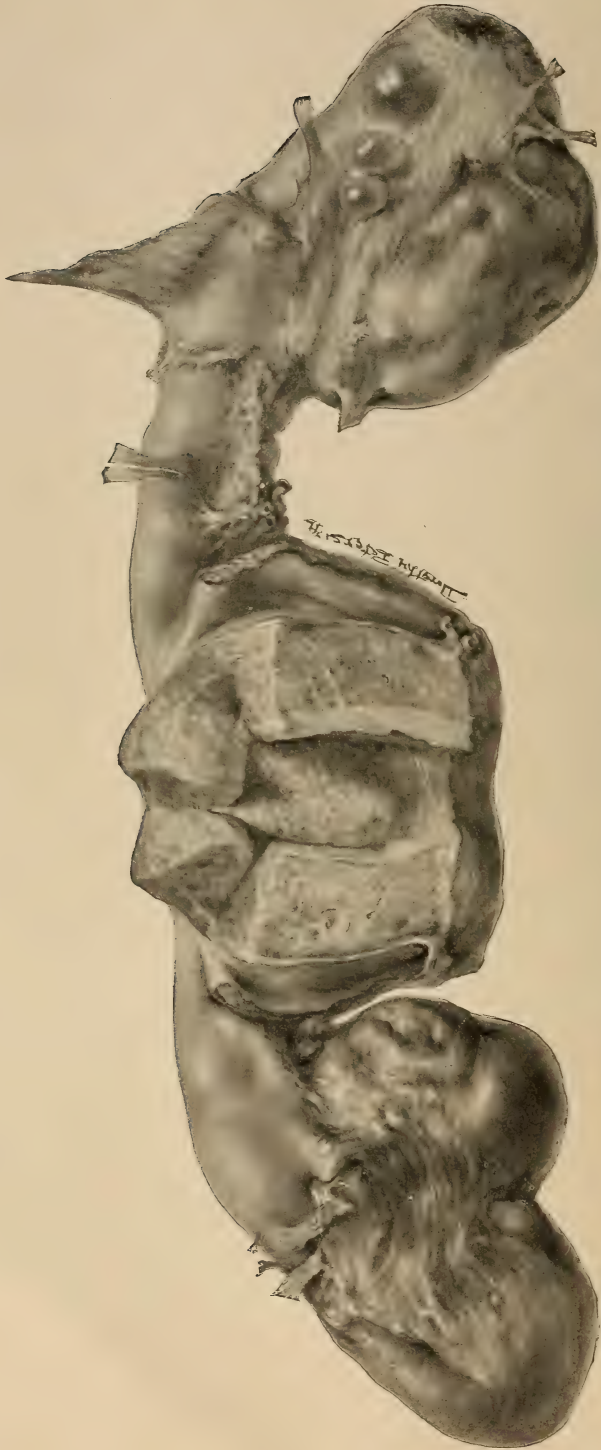


FIG. 353.—Tubo-ovarian abscess. (Norris, Gonorrhoea in Women, W. B. Saunders Co.)

very often this does not occur and the pus becomes non-infectious. The exudate thrown out at the height of the inflammation is absorbed and the infiltration of the peritoneum, tubal walls, ovarian capsule, and uterus disappears to a greater or less extent, but the tube remains permanently damaged and the ovary adherent or cystic.

Tubo-ovarian Abscess.—If an ovarian abscess happens to lie in apposition with the distended outer extremity of a pyosalpinx, the septum between them may break down so that the tubal and ovarian collections of pus merge and a tubo-ovarian abscess is formed (Fig. 353). If the outer extremity of a pus tube becomes adherent to the ovary at the site of an unruptured Graafian follicle, the intervening septum may become thinned out and rupture, allowing the pus and the serous contents to merge, secondarily infecting the follicle, and leading to the formation of a tubo-ovarian abscess.



FIG. 354.—Hydrosalpinx (Bryn Mawr Hospital).

End-result of Perisalpingitis.—In some cases perisalpingitis may subside with the formation of only a small amount of exudate, which may be entirely absorbed, so that the tube is restored to a normal condition and no evidence of the trouble remains. In other instances, where the infection has been marked and the exudate massive, the outer surface of the tube remains permanently attached to the surrounding structures by adhesions. If the adhesions are sufficiently extensive and so placed as to close the abdominal ostia of the tubes, the lumen may become distended with clear, watery fluid, forming a hydrosalpinx.

Hydrosalpinx.—A hydrosalpinx is a tube closed at its abdominal extremity and distended with clear fluid (Fig. 354). Several factors, as a rule, play a part in the etiology; first, an inflammation of bacterial origin, which closes the abdominal ostium by adhesions; secondly, a closure of the uterine

end of the tube by distention or kinking, and thirdly, the gradual accumulation of the normal tubal secretion. Mechanical irritation alone, as, for example, the rubbing of the tubal ostium by a uterine fibroid, or a retroflexed uterus, is not considered sufficient to produce a closure of the tube. But such a tumor or displacement of the uterus may predispose to hydrosalpinx when the bacterial infection is of slight degree and when it would under ordinary conditions subside without notice and without a residuum of adhesions. The weight of evidence is that most cases of hydrosalpinx follow perisalpingitis of streptococcus, staphylococcus, or colon bacillus origin, associated with the post-partal or the post-abortal state. Never-

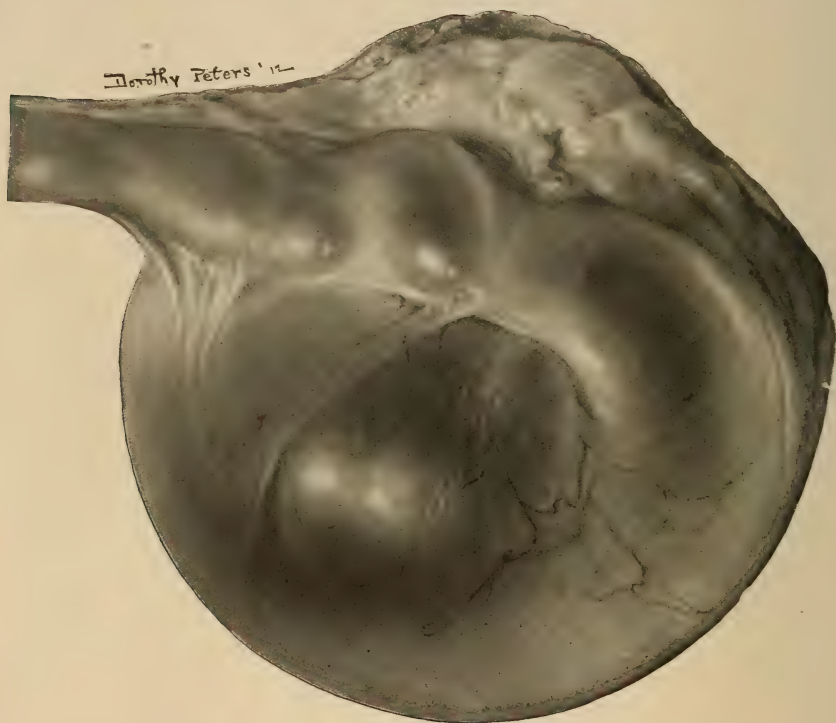


FIG. 355.—Tubo-ovarian cyst. (Norris, *Gonorrhœa in Women*, W. B. Saunders Co.)

theless, a certain proportion of hydrosalpinx represents a terminal stage of pyosalpinx. This statement is based on clinical evidence, such as the revelation at operation of hydrosalpinx months or years after well-established cases of gonorrhœal pyosalpinx, and upon the histologic features of certain cases of hydrosalpinx (*hydrosalpinx follicularis*) in which the serous fluid is confined, not in one large cavity representing the lumen of the tube (*hydrosalpinx simplex*), but in multiple cystic spaces between the stunted, partially destroyed, and coalesced folds of mucosa. In such instances an antecedent suppurative inflammation of the mucosa is difficult to deny.

The wall of the tube in simple hydrosalpinx (Fig. 354) is considerably stretched and thinned, the degree of distention varying. The hydrosalpinx

may be the size of a finger, or it may form a tumor large enough to be palpated through the abdominal wall, and contain a liter of fluid. In follicular hydrosalpinx the total amount of the fluid contained in the numerous cystic spaces is comparatively small and enlargement is usually moderate, a hydrosalpinx of this sort being rarely thicker than a finger. There are some cases of hydrosalpinx which intermittently discharge their contents through the uterine end of the tube into the uterus (*hydrops tubæ profluens*).

Tubo-ovarian Cyst.—A tubo-ovarian cyst is a combined cystic distention of the tube and ovary. The cyst is filled with clear or blood-tinged fluid. A tubo-ovarian cyst may be formed by adhesions between a hydrosalpinx and a cystic ovary and the coalescence of their fluid contents by rupture or atrophy of the dividing septum. It is likely that some tubo-ovarian cysts represent the end stage of a tubo-ovarian abscess—the purulent material having been absorbed and then replaced by watery fluid (Fig. 355). A tubo-ovarian cyst forms a retort-shaped tumor. From the outer surface it may be difficult to distinguish where the tubal part of the cyst ends and the ovarian part begins. Usually, upon opening the tumor, the remains of the fimbria, flattened out upon the inner wall at the original position of the abdominal ostium, may be distinguished.

Hæmatosalpinx, or a distention of the closed tube with blood, may result from hemorrhage into a hydrosalpinx which has become twisted on its pedicle, or has been subjected to some form of trauma. Usually it is the result of an ectopic pregnancy in the affected tube. The consideration of hæmatosalpinx, therefore, naturally falls under accidents to hydrosalpinx or tubal gestation.

NEW FORMATIONS OF THE TUBE

Polyps.—Polyps are very rare. They are often confused with circumscribed thickenings of the mucosa.

Papillomata.—Papillomata are difficult to distinguish from cancers which have a papillary structure, or, on the other hand, from unusually marked folding of the tubal mucous membrane.

Cyst of the Tube.—Cysts of the tube may be miliary, studding the peritoneal surface of the tube and the broad ligament. They may project from the abdominal fimbria, and may also occur in the wall of the tube, or under the mucous membrane. Tubal cysts may be true hydatids of Morgagni; they may be caused by peritoneal irritation with invagination of the peripheral endothelium, or they may result from lymphangiectasis.

Myomata.—Myomata have been mistaken for salpingitis nodosa. The same is true of adenomyoma. True cases of myoma are rare. These tumors vary in size from a hazel nut to an egg. The uterine end of the tube is in the usual situation. Microscopically, the tumor consists of fibrous and muscle tissue. Adenomyoma is much more frequent and has been discussed. (Page 326.)

Embryomata of the Tube.—These are usually dermoids. They are very rare. Products of an old tubal pregnancy have been mistaken for embryoma. The contents resemble those of dermoid cysts elsewhere. Grossly, the tube looks like an ordinary sactosalpinx with adhesions.

Carcinoma of the Tube.—Carcinoma of the tube is rare. Secondary cancer is more frequent than primary. Primary cancer of the tube had been reported eighty-six times in 1909. The disease is usually unilateral. Once in four or five times it is bilateral. Inflammatory disease of the tube seems to predispose to cancer. Carcinoma may begin as a degeneration of a benign papilloma, but this is unusual. The tube is, as a rule, enlarged, appears like a hydrosalpinx, and is surrounded by adhesions. The tumor is rapid in growth, and gives early metastasis. There are no characteristic symptoms, the clinical manifestations being usually those of chronic pelvic inflammatory trouble. There may be a watery, blood-stained leucorrhœa, and at about the cancer age atypical hemorrhage. Pelvic examination usually shows a condition simulating pelvic inflammatory trouble. Norris recommends that, when operating on patients for pelvic inflammatory disease at the cancer age, the tubes should be opened before the abdomen is closed and, if a papilloma is found, a radical operation should be carried out.

SYMPTOMS, DIAGNOSIS, AND TREATMENT OF AFFECTIONS OF THE FALLOPIAN TUBES

Acute salpingitis is so uniformly associated with acute pelvic peritonitis and acute oöphoritis that the symptoms, diagnosis, and treatment of all three conditions may be logically and conveniently combined under the term acute pelvic inflammatory disease (see Chapter XXI, page 411).

Chronic salpingitis, hydrosalpinx, etc., are likewise so frequently coincident with chronic oöphoritis and pelvic peritonitis that their symptoms, diagnosis, and treatment have been considered together under chronic pelvic inflammatory disease, page 428. New growths of the tube are accidental findings or resemble chronic inflammatory disease of the tubes to such an extent that they may very properly be included in the latter group, at least in so far as symptoms and diagnosis are concerned. In regard to treatment, new growths of the tube must be removed by salpingectomy or, if the growth is benign, by partial resection of the tube. In the case of carcinoma of the tube, both adnexa and the uterus should be removed.

ACCIDENTS AFFECTING TUBAL ENLARGEMENTS

Rupture of Pyosalpinx.—A pyosalpinx rarely may rupture. Bovée, in 1910, was able to find 55 cases recorded in the literature, and Norris found 99 cases in 1913. The accident has usually followed trauma of some sort, such as coitus, straining at stool, etc. As a result of the rupture and the escape of pus, there may be a rapid peritonitis if the pus is infectious. Otherwise the escaped pus may be absorbed. The symptoms are acute, agonizing pain in the lower abdomen, followed shortly by shock, and later by the evidences of an acute peritonitis. If the pus is sterile, the last-mentioned symptoms do not appear, although the absorption of the toxic products from the dead bacteria in the tubes may occasion some fever, acceleration of pulse, etc.

The treatment consists of immediate operation, with the removal of the affected tube. Both adnexa and the uterus should be extirpated if they are diseased, and if the condition of the patient will permit.

Rupture of a Hydrosalpinx.—This accident, too, is very infrequent.

The symptoms are sudden, acute pain, followed by shock or the evidence of internal hemorrhage. Often it will be impossible to make the exact diagnosis. Operation is advisable, at which time the diseased pelvic organs must be removed.

Torsion of Tubal Enlargements.—Torsion of tubal enlargements occurs rarely, there being about eighty-eight cases recorded in the literature in 1912. In twelve cases a pyosalpinx underwent torsion (Fig. 356). Hydro-salpinx is much more likely to undergo this complication on account of its retort shape, since the isthmus acts as a pedicle. Other enlargements were new growths and ectopic pregnancy. The symptoms have most frequently resembled those of acute torsion of an ovarian cyst,



FIG. 356.—Tuberculous pyosalpinx, torsion and necrosis (University Hospital).

namely, sudden agonizing pain, shock, rapid pulse, and rapid respirations, or of a ruptured ectopic, or acute appendicitis. A positive diagnosis is almost impossible, but the condition should be kept in mind. If a twisted tubal enlargement is strongly suspected, immediate operation is indicated. The twisted tube with its ovary, if that is involved, should be removed. If the patient's condition is good, other abnormalities found in the pelvis may be dealt with *secundum artem*.

EXTRAUTERINE PREGNANCY

When the fertilized ovum develops outside the uterine cavity the pregnancy is spoken of as extrauterine or ectopic.

Etiology.—The cause of this condition is some interference with the

passage of the fertilized ovum from the ampulla of the tube, where fertilization usually occurs, into the uterus. Conception need not necessarily take place in the tube, for the spermatic particle may advance as far as the ovarian fimbriæ to meet the ovum or, indeed, penetrate the spot of rupture on the Graafian follicle and fertilize an ovum which has remained therein. Again, the spermatic particle may wander from the extremity of the tube on one side and fertilize an ovum from the opposite ovary, or an ovum of one ovary may be fertilized by a spermatic particle in the opposite tube. Or, again, an ovum fertilized at the outer extremity of one tube may be carried across the pelvis and be swept down the opposite tube into the uterus.

The factors which may interfere with the passage of the fertilized ovum into the uterus are numerous: fibroid tumor in the uterine cornua, congenital diverticula in the tube, polyps of the tubal mucosa, obstruction of the lumen of the tube by congenital angulation or by an angulation caused by adhesions, obstruction of the lumen of the tube by inflammatory processes which

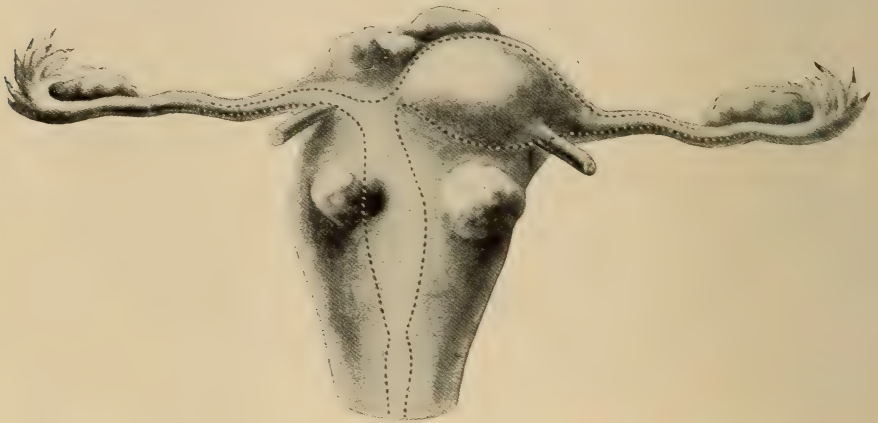


FIG. 357.—Interstitial pregnancy, (University Hospital).

form little blind pockets, by reason of the adhesions at the tips of neighboring plica—all of these may obstruct the passage of a fertilized ovum into the uterus. The most common cause, it must be admitted, from both clinical and pathological evidence, is some inflammatory lesion of the adnexa. Ectopic pregnancy may coexist with normal intrauterine pregnancy. Repeated tubal pregnancy, first in one tube and later in the other, occurs occasionally. Rarely twin, or even triplet, tubal pregnancy has been observed.

Varieties of Ectopic Pregnancy.—The fertilized ovum may rest and subsequently develop in a Graafian follicle of the ovary (*ovarian pregnancy*), upon the ovarian fimbriæ (*tubo-ovarian pregnancy*), or within the ampulla (*ampullar pregnancy*), isthmic (*isthmial pregnancy*), or interstitial (*interstitial pregnancy*) (Fig. 357) parts of the tube. Development in some part of the tube is far more common than outside of it. It is doubtful whether primary nidation upon the peritoneal surface (*abdominal pregnancy*) occurs—although, secondarily, the ovum may become attached in that position after it has escaped from its primary resting-place in the tube or the ovary.

Pathology—Nidation of the Ectopic Ovum.—The nidation of the ectopic ovum must be somewhat different from the normal intrauterine process because the structures with which the ovum comes into immediate relation are not like the soft, succulent, decidual endometrium lining the uterine cavity. The coverings of the ovum, however, are the same and its outer capsule, the chorion, is furnished with the same trophoblast cells and villi—so that it has the power of burrowing into tissue and, by osmosis and the corrosion and opening up of blood-vessels, of providing itself with nourishment. There is some doubt as to the development within the tube of a decidual tissue either as a provocative cause of retention of the fertilized ovum, or as a result of its retention, or as a common occurrence incident to pregnancy. It is likely that there is a slight decidual reaction of the lymphoid stroma cells of the plica in most cases of tubal pregnancy. Whether or not this is true, the ovum burrows its way either into a fold of the mucosa or between adjoining folds. As it goes on growing, the wall of the tube, which has become somewhat hypertrophied and more succulent than during the non-pregnant state, is invaded by the ovum which finally takes a position within its layers and outside the lumen of the tube. As the ovum develops within the wall, the lumen is pressed toward the opposite side so that on cross-section it may be represented by no more than a crescentic slit. The chorionic villi take root in the maternal tissues by virtue of the corrosive action of their syncytial covering. A hemorrhage into the tissues surrounding the ovum may interrupt its further development. This is the fate of a certain proportion of tubal pregnancies. Thus a tubal mole is formed, which in rare instances may be absorbed. In other cases the enlargement of the tube remains, sooner or later giving rise to symptoms. It is possible that the chorion may keep on growing for a time after the ovum itself has perished, otherwise it is hard to understand the number of cases of tubal pregnancy giving rise to active symptoms (abortion or rupture) in which no trace of the ovum itself can be found.

Tubal Abortion and Tubal Rupture.—In the majority of cases after the tubal gestation has progressed to a certain extent—eight or twelve weeks in the most common (ampullar) form—there is a rupture in the surrounding muscular and connective-tissue capsule of the developing embryo. This rupture may occur either toward the serous coat of the tube if the ovum has eaten its way furthest in that direction, or toward the mucous coat if the opposite is true. As a result of the former the outer coat of the tube is torn and there is free intraperitoneal hemorrhage (Fig. 358); the ovum may or may not be discharged into the peritoneal cavity. As a result of the latter, the ovum escapes into the lumen of the tube, where it excites periodic con-



FIG. 358.—Early extrauterine pregnancy, rupture and bleeding, (Bryn Mawr Hospital.)

tractions of the muscular coat which may expel it through the abdominal ostium into the peritoneal cavity. In rare instances the weakening and corrosion of the tube wall may be toward the mesosalpinx, so that the ovum escapes into the broad ligament between its peritoneal layers.

Fate of the Ovum.—In the majority of cases there is no trace of the embryo (Figs. 359 and 360). As the result of hemorrhage into the foetal envelope, as noted above, the ovum has usually perished before abortion or rupture occurs. When the ovum is viable at the time of abortion or rupture, its subsequent fate depends upon whether a placenta has already formed and whether it remains attached. Thus the ovum may go on grow-



FIG. 359.—Extrauterine pregnancy with beginning tubal abortion. (Bryn Mawr Hospital.)

ing outside the tube, being connected by the umbilical cord to the placenta, which remains undisturbed therein. Or, if the amniotic sac is unbroken (Fig. 361) and the ovum is young, even though the chorion is detached from its original nest, the ovum may find a new point of attachment and new source of nourishment in the free peritoneal cavity (*abdominal pregnancy*).

Abdominal Pregnancy.—In some cases *full development* of the ovum has taken place in the abdominal cavity. When this occurs, if the foetus is not removed by abdominal section at term, it will die. The fat may be converted into adipocere (lithopedion formation). Such a condition has usu-

ally been mistaken for an abdominal tumor of one of the more common varieties, and the true state of affairs has been recognized only at operation. There will probably be the customary history of tubal pregnancy which can be elicited on close questioning, and the patient may recall a considerable amount of pain at the time when labor was due.

The pregnancy *may not go on to term*, the growth of the foetus being interrupted at some time prior to that period of gestation. Under these circumstances the body usually mummifies, or undergoes lithopedion formation, or the soft parts are absorbed and the skeleton remains. The foetal structures may become infected, with the formation of an abscess, which subsequently may rupture into the neighboring intestine or bladder, the true nature of the process being revealed by the discharge of skeletal parts.

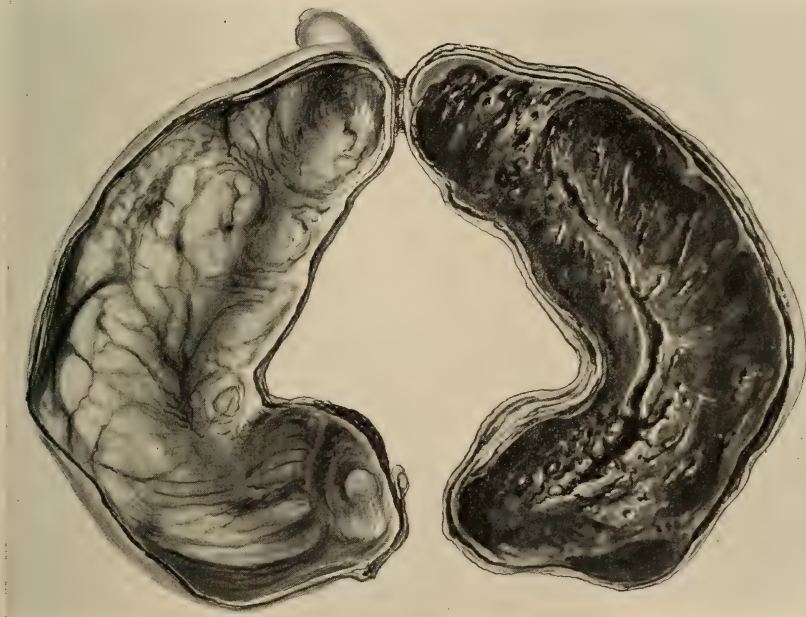


FIG. 360.—Longitudinal section of tube shown in Fig. 359, blood-clot removed from one side, tubal mole in the other side; no gross trace of the ovum.

Hemorrhage, Pelvic Hæmatocele, Free Intraperitoneal Bleeding.—

Hemorrhage into the peritoneal cavity from external rupture of an ectopic ovum is usually great, and the patient may be rapidly exsanguinated. The nearer the point of rupture to the uterine cornu, the larger are the blood-vessels which are torn and the more likely is the bleeding to be uninterrupted and serious. In tubal abortion the amount of blood lost is less and the hemorrhage is slower. When only a small amount of blood escapes into the peritoneal cavity, it may become absorbed; when it escapes in larger quantity it collects in the dependent parts—Douglas' pouch. Here the fluid constituent is absorbed, the blood-clot becomes encapsulated by the organization of the peripheral layer and the adhesions which are contracted be-

tween the latter and the surrounding intestines and peritoneum. In the course of time the blood may become entirely absorbed, intestinal and peritoneal adhesions being the only evidence of the previous hæmatocele. Unless the hæmatocele is small, absorption is not the rule. The pelvic mass persists, gives rise to symptoms—pain, moderate fever, diarrhœa—and, if the blood-clot is not evacuated by operation, infection almost always occurs with the formation of a pelvic abscess.

Uterine Changes in Ectopic Pregnancy.—The uterus undergoes some hypertrophy in the early weeks of tubal pregnancy. The endometrium is transformed into a decidua consisting of the superficial compact and the deep spongy layer. The cervix may be very slightly softened, and there may be some bluish discoloration of the anterior vaginal wall. Between



FIG. 361.—Longitudinal section of pregnant tube; ovum in amniotic sac. (Laboratory, Gynæcean Hospital.)

the eighth and twelfth week the compact layer of the decidua begins to separate from the underlying spongy part and the decidual tissue, acting more or less like a foreign body, excites contractions of the uterus. Hemorrhage also occurs from rupture of the small decidual vessels. The decidua may be discharged in one piece, exhibiting a perfect mould or cast of the inside of the uterus; or as is more commonly the case, in small separate portions. After the decidua is all discharged the bleeding may be continued by subinvolution of the uterus, which usually persists until the pregnancy has been removed by operation.

Fate of the Pregnant Tube.—The enlarged pregnant tube frequently excites local inflammatory changes in the structures surrounding it, which result in adhesions. The pregnant tube may become enveloped in omentum; it may become adherent to the peritoneum over the bladder or at the bottom or sides of the pelvis.

Symptoms—Previous to Tubal Rupture or Abortion.—The most common symptom of ectopic pregnancy before rupture or abortion is an irregular but persistent slight bleeding or spotting, occurring with or without a preceding cessation of the menses for one or two months. Usually the patient has missed a period, but there are many cases in which there has been no cessation of menstruation, although something atypical has been noticed about the last one. It has been scanty, or long drawn out, or quite profuse and then has stopped entirely for a day, only to reappear every day or two, a few drops at a time. The patient often believes herself pregnant and speculates as to the significance of the returning or atypical menstrual flow. Exceptionally, shreds of decidua or even a decidual cast of the uterine interior may be recovered by the patient from the bloody discharge. As a

rule, the decidua is expelled in such small disintegrated portions that it escapes observation. The associated signs and symptoms of pregnancy are not constant or well marked. Morning nausea, fullness, and heat in the breasts, and discoloration of the vaginal mucosa may or may not be recognizable. With the irregular hemorrhage or spotting there is some pain which may be more severe on one side, a slight elevation of temperature, 99° F., and a small increase in the leucocytes, 9000–11,000. These symptoms occurring in a woman who has borne children previously, but thereafter has remained unproductive for a considerable time, are very significant. All the more so if there is a history of some intervening pelvic inflammatory trouble at the time of labor or abortion.

Symptoms of Tubal Rupture or Abortion.—To the above symptoms may be added suddenly those which indicate rupture of the tube or a tubal abortion. These are acute lancinating pains in one or the other side of the lower abdomen, followed by faintness, pallor, rapid respiration, and rapid, feeble pulse. If the hemorrhage is free, the severity of the symptoms will be much greater than those resulting from slow or intermittent bleeding. Preceding the rupture, there may be a period during which the patient suffers at intervals with severe colicky pains in one side of the lower abdomen (contractions of the tube, stretching of the peritoneal coat); rupture of the tube may then be followed by a cessation of the greater part of the pain, and the rapid development of the indications of internal hemorrhage. The shock attending the pain and the evidences of internal hemorrhage may often be progressive up to a certain point and then subside, this depending upon whether or not abortion of the ovum with cessation of hemorrhage or a rupture of the tube with limited and non-recurring hemorrhage has occurred. Sometimes such a history may be elicited after the patient has been operated on for another purpose and old blood-clots and cicatrices have been found in the tube.

Symptoms Following Rupture or Abortion in Case of Abdominal Pregnancy.—After the early indications of pregnancy and the symptoms in moderate degree of rupture or tubal abortion, the subjective manifestations of pregnancy may continue and increase even up to term. The abdomen will gradually enlarge, foetal movements will be recognized, and the patient may consider herself normally pregnant. At term there may be cramp-like pain, some hemorrhage, and the discharge of decidual shreds—without expulsion of the embryo. At this time, if the condition is recognized, prompt abdominal section may possibly result in a living foetus. Quite often the true state of affairs is not recognized at the time; the pain and the uterine hemorrhage are regarded as false labor, the foetus perishes and undergoes mummification or lithopedion formation, and the actual condition is revealed months or years afterward.

Diagnosis—Before Rupture.—The symptoms of an ectopic pregnancy vary according to its location, accidents of growth, and termination. No other pelvic condition is so frequently mistaken for something else. Nevertheless, many cases are so *typical* that a correct diagnosis can be made from the history alone.

Some irregularity in menstruation, particularly amenorrhœa, for six

to eight weeks and then "spotting" and abdominal pain in a woman a long time married and sterile, or in one who was at first prolific but has not been pregnant for some years, often correctly indicate extra-uterine pregnancy. If combined with these symptoms the uterus is slightly increased in size and a sensitive enlargement on either side to the front or back of it can be made out, a diagnosis of unruptured ectopic pregnancy is justified. From threatened or incomplete miscarriage with pelvic tumors, inflammatory or otherwise, it often may be distinguished by the size of the uterus which does not correspond to the probable duration of pregnancy, or by the condition of the os which is not open and is not as soft as in intrauterine gestation. The temperature in tubal pregnancy before rupture is rarely over 99° F.; there is usually a slight increase in the leucocytes—9000—11,000—rarely more; there is not the dense infiltration and fixation of a fresh inflammatory case, and yet the symptoms indicate that the condition is something new, something comparatively recent in the history of the patient. Intrauterine pregnancy, with threatened miscarriage and a twisted hydrosalpinx or ovarian cyst, may simulate closely an extra-uterine gestation. The indications of a miscarriage, however, are more positive, and a true cyst of the ovary is usually larger.

Diagnosis—At Rupture or Abortion.—The acute pain, shock, and symptoms of hemorrhage at the time of rupture or abortion quite frequently prevent a satisfactory pelvic examination, and the physician should bear in mind that in such an extremity the greatest gentleness must be exercised to prevent an exaggeration of the hemorrhage by manipulations of the pelvic organs. Under these conditions the diagnosis must be based on the subjective symptoms and history, and upon very gentle examination. It may be evident upon inspection that the bluish discoloration of pregnancy is present, that the breasts are slightly enlarged, the cervix is softened, and that a very sensitive, ill-defined mass exists to one side of, and behind or in front of, the uterus, possibly barely felt by the abdominal palpating hand. If the hemorrhage is free, the evidence of fluid blood in the abdomen—dull flanks, fluctuation, etc.—may be made out. In some cases the pelvic examination is absolutely negative and the diagnosis must be based upon the history and the subjective indications. The pregnant tube may be enlarged so slightly, notwithstanding the fact that a perforation of its wall or the escape of the ovum through its outer ostium is causing serious hemorrhage, that even intra-abdominal palpation discovers nothing, and actual inspection of the tube is necessary to be sure of the source of the trouble. A very considerable amount of free fluid blood in the peritoneal cavity may be unrecognizable by any method of physical examination. Under such circumstances the pallor of the patient is a striking symptom; the conjunctiva and the lips are blanched; the skin has a bluish-white or a yellowish hue; the fingernails no longer exhibit the pink capillary flush. When shock without hemorrhage is difficult to distinguish from shock with hemorrhage, a red blood count and hæmoglobin estimation often afford valuable evidence one way or the other.

Diagnosis of Hæmatocele Formation.—After the critical symptoms have subsided and the blood which has been poured out into the pelvis has formed a

clot, a very characteristic sensation may be imparted to the vaginal or rectal finger on bimanual examination; namely, the peculiar crepitation which may be felt upon breaking up a thick jelly. When the clots are older and an actual hæmatocele has formed, the pouch of Douglas may be filled with a fairly resistant mass closely incorporated with the uterus and adnexa. Some of the blood is usually fluid and may occupy the center of the mass, so that the fluctuation may be detected. If infection and suppuration occur, the temperature increases and the leucocytosis becomes more marked. When the hemorrhage continues slowly and many clots are formed, lying among the intestinal coils with beginning organization and plastic peritonitis, there may be tenderness and rigidity of the abdominal wall and a considerable degree of leucocytosis.

Diagnosis of Abdominal Pregnancy.—A tubal pregnancy which has ruptured and been extruded into the abdominal cavity and continues to grow may give rise to abdominal enlargement, foetal movements, and heart sounds almost identical with what is observed during normal intrauterine pregnancy. Early in extrauterine pregnancy the enlargement may be a little to one side of the median line and later the long axis of the enlargement may be transverse or diagonal oftener than in normal pregnancy. The normal outline of the uterus and the uterine contractions, of course, are not apparent, but the sensitiveness of the abdomen, and the spasm of the abdominal muscles during palpation, may explain this to the physician's satisfaction. In doubtful cases, under general narcosis, the discovery by palpation of the uterine body, normal or but slightly increased in size, quite distinct and separate from the foetal parts, gives sufficient information to establish the diagnosis. When the pregnancy has gone on to the third or fourth month and the foetus has perished and become mummified or petrified, it forms a peculiar enlargement to one side of or behind the uterus, which at once impresses the examiner with the fact that he is dealing with something unusual. It may be possible to make out the various foetal parts. The greatest difficulty in doing this may arise if a recent intrauterine pregnancy complicates an old extrauterine pregnancy.

Prognosis.—The prognosis of extrauterine pregnancy is always doubtful. At the present time, in good hands, few cases will progress beyond the first two or three months of gestation without being recognized, and as soon as the diagnosis is certain will be exposed to operation. The mortality rate in operation on ectopic gestation is no higher than in any uncomplicated aseptic celiotomy. Neglected cases, whether early or late, may end disastrously. Cases seen for the first time when rupture or tubal abortion has occurred or is imminent, if dealt with promptly and properly, will usually recover. Cases which are exposed to operation some time after free intraperitoneal hemorrhage has occurred with the subsequent formation of clots, show a mortality a bit higher than the usual celiotomy cases because of the greater tendency to post-operative infection, bacteria already being present in the hæmatocele or the clots left after the enucleation and forming an unusually favorable nidus for the growth of germs introduced by accident. The prognosis of cases not submitted to operation early or late is unfavorable. Suppuration of the hæmatocele and spontaneous evacuation into the

bowel or bladder have been observed. The hemorrhage may continue and the amount of blood in the peritoneal cavity gradually increase with the extensive distribution of clot, plastic or septic peritonitis, and death.

Treatment.—There is but one form of treatment for tubal pregnancy and that is operation. The only questions to be decided are when to operate and what the nature of the operation shall be. As a rule, it may be said that operation should be undertaken as soon after the diagnosis is made as the patient can be properly prepared. This applies to unruptured as well as ruptured and tubal abortion cases. The only exception to this rule is in advanced cases of abdominal pregnancy, in which operation is deferred, hoping that a viable child may be secured by celiotomy at term. In the early stage of extrauterine pregnancy the patient should be immediately placed under such conditions that she can be exposed to operation at short notice. After the usual preliminary examination and preparation, which is advisable in all but emergency cases, operation should be carried out. At this time the pregnant tube should be removed by salpingectomy, and other pelvic lesions found at the time treated *secundum artem*.

Operation at the time of rupture or abortion, when the patient's condition is critical, must be consummated with the least possible delay. Everything should be prepared, the operator and his assistants, the instruments, the sutures, the abdominal surface, and the patient on the operating table, before anæsthesia is begun. In this way not a moment is lost. Nitrous oxide-oxygen and ether anæsthesia is the best for this operation. Apparatus for the subcutaneous injection or the intravenous infusion of salt solution must be at hand. In the most desperate cases the intravenous cannula should be in position and everything ready to start the injection as soon as pelvic hæmostasis is secured. As soon as the abdomen is opened the site of the pregnancy should be determined by palpation and a clamp placed on the broad ligament, close to the uterus on the affected side, to secure the utero-ovarian anastomosis, and another close to the pelvic extremity of the broad ligament to secure the ovarian vessels. This may be done by touch alone, if necessary, and no attention should be paid to the fluid blood or clots which may gush from the incision as soon as it is made. After the bleeding area has been caught between clamps in this way and hemorrhage can no longer occur, the excess of bloody fluid and clots may be removed by sponging, and the pelvis sufficiently exposed and isolated to carry out salpingectomy or salpingo-oöphorectomy, whichever is required. In desperate cases the simplest technic should be used, the chief aim of the operator being to get the abdomen closed quickly after ligating the vessels and removing the bleeding tumor. The gross fluid and clotted blood should be scooped out and the incision closed without delay. If the hemorrhage is recent, and the patient's condition serious, the abdominal cavity should be filled with salt solution before closing the peritoneum. If there is much old blood in the pelvis, and the operation has taken place during a recurrence of the hemorrhage, drainage through Douglas' pouch or a suprapubic opening should be employed.

The advice here given is not in accord with the teachings of a few gynecologists who in desperate cases advocate delay until reaction occurs. The

assumption underlying this position is that the hemorrhage will cease when the blood-pressure has been reduced to a certain point, provided the patient is not disturbed by pelvic examination, transportation to a hospital, and stimulation. The application of this teaching has not been successful in practice and is generally considered pernicious. But the discussion of the question has emphasized several very important points: First, that a pelvic examination in ruptured tubal pregnancy or tubal abortion may seriously increase the amount of hemorrhage; that nothing but the gentlest examination is permissible, and that it should not be repeated. Secondly, that the active use of cardiac stimulants, hypodermoclysis, etc., may prolong the hemorrhage, prevent the formation of clots, and actually exsanguinate the patient. The practical deductions from these facts are: To rely upon the history or to make but one examination, and that in the gentlest manner; to use morphine hypodermically to quiet the patient after a positive diagnosis is made; to transport the patient with the greatest care compatible with speed to the nearest operating room; to avoid any but the mildest and most carefully guarded stimulation until the bleeding vessels are controlled by ligature.

When the case is of long standing, the hæmatocele well organized, and the patient in such a state that there need be no undue haste, careful attention should be paid to technic; the ovary on the affected side may be conserved, the opposite adnexa examined and dealt with in approved fashion. When the hæmatocele has been everywhere adherent, so that small pieces of blood-clot must be left attached to peritoneal surfaces in the pelvis, or in any case in which the possibility of infection seems more pronounced than usual, drainage through a posterior vaginal or suprapubic incision should be instituted.

In the case of suppurating pelvic hæmatocele, the most suitable method of treatment consists in a posterior vaginal incision, evacuation of the pus, and drainage.

In advanced abdominal pregnancy the sac may be surrounded by dense adhesions or it may be free, hence its removal may be either very difficult or quite as easy as the removal of an ordinary cyst. The chief difficulty, however, is in dealing with the placenta. The hemorrhage caused by removing this at once may be rapidly fatal. At term or near term it should never be attempted; instead, the margins of the foetal sac should be stitched to the abdominal incision, the umbilical cord cut short, the cavity packed with gauze, and the placenta permitted to separate slowly. When the foetus in abdominal pregnancy dies near term, operation should be deferred for three or four weeks, to allow the vessels at the placental site to become at least partially obliterated.

BIBLIOGRAPHY

- ANSPACH, B. M.: "Torsion of Tubal Enlargements with Special Reference to Pyosalpinx." *Amer. Jour. Obst.*, 1912, lxvi, 553; *Ibid.*: "Four Cases of Extrauterine Pregnancy with Reference Especially to Their Etiology." *U. of P. Bull.*, July, 1902.
- BOVÉE, J. W.: "Acute Diffuse Suppurative Peritonitis from a Ruptured Pus Tube." *Surg., Gyn. and Obst.*, 1910, x, 406-411.
- CLARK, J. G., AND NORRIS, C. C.: "Conservative Surgery of the Pelvic Organs in Cases of Pelvic Peritonitis and of Uterine Myomata." *S., G. and O.*, 1910, xi, 398; *Ibid.*: "Results Following the Treatment of Pelvic Inflammatory Lesions by Surgical Measures." *S., G. and O.*, 1917, xxv, 33.

- CRAIN, E. B.: "The Treatment of Full Term Ectopic Gestation." *Am. J. Obst.*, 1900, xli, 740.
- DORLAND, W. A. N.: "Repeated Extrauterine Pregnancy." *Am. Jour. Obst.*, 1898, xxxvii, 478.
- FRANK, R. T.: "An Analysis of Eighty Consecutive Cases of Ectopic Gestation." *Amer. J. Obst.*, 1909, lix, 211.
- FROMME U. HEYNEMAN: "Die Hydrosalpinx." *Veits Handbuch*, 2nd Edt., p. 137.
- FÜTH: "Studien über die Einbettung des Eies in der Tube." *Monats. f. Geb. u. Gyn.*, 1898, 590-613.
- GELLHORN, G.: "Salpingostomy and Pregnancy." *Trans. Amer. Gyn. Soc.*, 1911, xxxvi, 186.
- GLITSCH: "Zur Aetiologie der Tubenschwangerschaft." *Arch. f. Gynäk.*, 1900, lx, 385.
- HOFMEIER: "Zur Pathologie der Extrauterinschwangerschaft." *Berlin, Klin. Woch.*, 1905, xxvii, 847.
- KLEINHANS: "Die Erkrankungen der Tube." *Veits Handbuch*, iii, 1st Edition.
- LANDAU U. RHEINSTEIN: "Beiträge zur Pathologische Anatomie der Tube." *Archiv f. G.*, 1891, xxxix, 273.
- MANDL U. SCHMIDT: "Beiträge zur Aetiologie und Pathologischen Anatomie der Eileiterschwangerschaften." *Arch. f. Gyn.*, 1898, S. 401.
- MARTIN: "Ueber Partielle Ovarien und Tubal Extirpationen." *Völk. Samm. Klin. Vrot*, 1889; *Ibid.*: Die Krankheiten der Eileiter. Leipzig, 1895, Bd. i.
- MARTIN U. ORTHMAN: Eileiterschwangerschaft. Die Krankheiten der Eileiter. Berlin und Leipzig, 1895.
- NORRIS, C. C.: "Primary Carcinoma of the Fallopian Tube and the Report of a Case." *S., G. and O.*, 1909, viii, 272.
- OPITZ: "Ueber die Ursachen der Ansiedelung des Eies im Eileiter." *Zeit. f. Geburtsh. u. Gynäk.*, 1902, Bd. xlviii.
- PARRY: Extrauterine Pregnancy. 1876.
- POZZI: De la re'section et de L'ignipuncture de gyn. 1897.
- ROBB, H.: "Ectopic Gestation with Special Reference to the Treatment of Tubal Rupture." *Amer. Jour. Obst.*, 1907, lvi, 6.
- ROBSON: "Primary Ovarian Gestation." *Trans. London Obst. Soc.*, 1902, xlv, 215.
- RUBIN, I. C.: "The Simulation of Corpus Luteum and Retention Cysts of the Ovary with Ectopic Pregnancy and Early Uterine Abortion." *Surg., Gyn. and Obst.*, 1917, xxiv, 443.
- RUNGE: "Beitrag zur Anatomie der Tubargravidität." *Arch. f. Gyn.*, 1904, lxxi, 652.
- SAMPSON, J. A.: "Influence of Ectopic Pregnancy on the Uterus." *Trans. Amer. Gyn. Soc.*, 1913, xxxviii, 121.
- SIMPSON, F. F.: "Deferred Operation for Ruptured Ectopic Gestation." *Surg., Gyn. and Obst.*, 1907, v, 503; *Ibid.*: "Deferred Operation for Intra-abdominal Hemorrhage Due to Tubal Pregnancy." *Trans. Amer. Gyn. Soc.*, 1908, xxxiii, 19.
- SKUTSCH: "Beitrag zur Operativen Therapie der Tubenerkrankungen." *Centr. f. Gyn.*, 1889.
- SMITH, R. R.: "Repeated Ectopic Pregnancy." *Trans. Amer. Gyn. Soc.*, 1911, xxxvi, 425; *Ibid.*: "Final Results (after five years) in 192 Patients Operated Upon for Ectopic Pregnancy; with Special Reference to Subsequent Uterine and Repeated Ectopic Pregnancies." *Surg., Gyn. and Obst.*, 1914, pp. 684-695.
- SPALDING: "Relative Frequency of Ectopic Gestation." *Trans. Sec. O. G. and A. S.—A. M. A.*, 1915, p. 114.
- TAIT, L.: *Lectures on Ectopic Gestation and Pelvic Hæmatocele*. Birmingham, 1888.
- VEIT, J.: *Die Verschleppung der Chorionzotten*. Wiesbaden, 1905.
- WEBSTER, J. C.: Ectopic Pregnancy. 1895; *Ibid.*: "Study of a Specimen of Ovarian Pregnancy." *Am. Jour. Obst.*, 1904.
- WERTH: "Die Extrauterinschwangerschaft." *Winckels Handbuch der Geburtshilfe*, 1904, Bd. ii, 2, 655.
- WILLIAMS, J. W.: "Extrauterine Pregnancy." *Kelly-Noble Gyn. and A. Surg.*, ii, 30. (Complete literature.)

CHAPTER XX

DISEASES OF THE OVARIES

INFLAMMATORY DISEASES

Acute Interstitial Oöphoritis—Etiology.—Acute interstitial oöphoritis may be caused by the direct extension, *via* the lymphatics, of an infection deposited in the uterus, incident to abortion, labor, or instrumentation (streptococcus, staphylococcus, colon bacillus, etc.). Acute interstitial oöphoritis may also occur secondary to acute endosalpingitis, an open Graafian follicle or corpus luteum being infected by purulent material escaping from the tube (gonococcus).

It is a matter of clinical observation that acute interstitial oöphoritis may complicate parotitis, scarlet fever, varioloid, measles, diphtheria, and typhoid fever (Frankl). The work of Rosenow and Davis shows that interstitial oöphoritis may be hæmogenic, the organisms being transported to the ovary from the site of focal infections, notably the tonsils or the teeth. In a series of fibrocystic ovaries exhibiting fibrocystic changes, Davis found the streptococcus viridans in 50 per cent. Other bacteria isolated were the staphylococcus albus, the pneumococcus, and an organism resembling the diphtheria bacillus. Davis regards this study as conclusive proof of the occurrence of hæmatogenous involvement of the ovaries from some of the more common foci of chronic infection.

Pathology.—Acute interstitial oöphoritis complicating post-abortal, post-partal, or instrumental infection is marked by œdema and swelling of the ovary and infiltration of the ovarian stroma with polymorphonuclear leucocytes. In the milder grades of infection the disease may subside without producing gross lesions. In the severer forms there is destruction of tissue with the formation of an abscess. An ovarian abscess of this type varies in size from that of a hazelnut to that of an orange (Fig. 362). There may be a number of small purulent collections at first, but these usually merge into one as the disease advances. When the acute interstitial oöphoritis is the consequence of a direct infection of an open Graafian follicle or corpus luteum by gonorrhœal pus from the tube, the inflammatory process is more or less limited to the infected follicle or corpus luteum. Abscess is not so frequent, and if it occurs is usually smaller and confined to the follicle or the corpus luteum, as the case may be.

Acute Perioöphoritis—Etiology and Pathology.—Acute perioöphoritis or acute inflammation of the ovarian capsule is most frequent in association with gonorrhœal salpingitis and pelvic peritonitis. The ovarian capsule becomes inflamed and very quickly covered with or embedded in the inflammatory products of the pelvic peritonitis. As a rule, in these cases the ovarian involvement is limited to the capsule, but, as noted above, exceptionally an interstitial oöphoritis may be produced. Perioöphoritis also may accompany and be a part of interstitial oöphoritis or pelvic peritonitis caused by a

post-abortion, post-partal, or post-instrumental infection. The changes in the capsule in this instance are not so marked, and the condition is usually secondary in importance and significance to the lesions which it complicates.

End-result of Acute Interstitial Oöphoritis.—Following an acute interstitial oöphoritis the inflammation may subside without any recognizable gross or histologic lesion, or the ovary may be permanently damaged and exhibit sclerosis, hypertrophy, or cystic degeneration. An abscess of the ovary, the size of an orange, causes active symptoms and must usually be evacuated by surgical interference, or, if the case is neglected, it may rupture spontaneously into the vagina, the intestine, or the bladder. The ovary may then return to an approximately normal size and appearance, or, if the greater part of the organ has been destroyed, it may be shrivelled and sclerotic. In the case of small abscesses, especially those secondary to gonorrhœal salpingitis and peritonitis, the acute process may subside and the purulent content be gradually disintegrated and partially absorbed.



FIG. 362.—Abscess of the ovary (Gynecological laboratory, U. of P.).

End-result of Acute Perioöphoritis.—Acute perioöphoritis of gonorrhœal origin, associated with gonorrhœal salpingitis and pelvic peritonitis, leaves the ovary with a thickened capsule and adhesions to the surrounding structures. In the course of time the ovary becomes cystic from the interference with the periodic rupture of ripe Graafian follicles (see Retention Cysts, page 402). Acute perioöphoritis, associated with

interstitial oöphoritis without abscess formation, may leave no permanent residue, the adhesions formed during the acute stage often entirely disappearing as the trouble subsides. Perioöphoritis associated with ovarian abscess is more likely to be followed by permanent adhesions; this is especially true when the abscess is of small size and has not been evacuated.

Symptoms, Diagnosis, and Treatment of Acute Inflammatory Diseases of the Ovaries.—Acute oöphoritis, both the interstitial and perioöphoritic varieties, are almost invariably combined with cellulitis, peritonitis, or salpingitis. The symptoms, diagnosis, and treatment of all these conditions are so intimately combined that they are considered together under pelvic inflammatory diseases. Oöphoritis is a more common incident of post-partal, post-abortion or instrumental pelvic inflammatory disease than of gonorrhœal pelvic inflammatory disease. The subject is dealt with in Chapter XXI, page 411.

Chronic Oöphoritis.—Chronic oöphoritis, either interstitial or perioöphoritic, is the end-result of an originally acute lesion (*vide supra*). It

is usually associated with chronic salpingitis or chronic pelvic peritonitis, and is a part, therefore, of chronic pelvic inflammatory disease. The symptoms, diagnosis, and treatment are described in Chapter XXI, page 411.

TUMORS OF THE OVARY

The ovary may be the seat of a variety of tumors. Tumors of an *epithelial type* originate in the epithelium of the Graafian follicle or the germinal epithelium, or in rests of the Wolffian system embedded in the ovary, while *connective-tissue growths* develop from the ovarian stroma. The epithelial tumors are almost uniformly cystic and far outnumber the solid tumors. Both solid and cystic growths may be either benign or malignant. Another form of ovarian tumor, etiologically and structurally different from either of the above, is the *teratoma*. These are usually cystic and take the form of the so-called dermoid cyst. Rarely they are solid or nearly so. In addition to these actual new growths of the ovary, there are other enlargements of the organ due to *hyperplasia* and *hypertrophy* of its constituents, and not in any sense true tumor formations. They result from abnormalities in the growth, development, and regression of the Graafian follicle and the corpus luteum.¹

¹ For convenience the tumors of the ovary may be grouped as follows:

Tumors of the Ovary.

Epithelial new growths	Benign (except some papillomata)	<i>Ovary proper</i> { Glandular cysts (adeno-cystomata) of the ovary }	Pseudomucinous
			<i>Parovarium</i> { Cysts of the Parovarium }
	Malignant	Carcinoma Primary-Secondary Carcinomatous degeneration of ovarian or parovarian cysts.	

Connective tissue new growths	Benign—Fibroma—Fibromyomata
	Malignant—Sarcoma—Endothelioma—Perithelioma

Combined epithelial and connective tis- sue new growths	{	Teratoma	{ Cystic or	{ "Dermoids" . . . "Struma ovarii" "Hydatidiform- mole-like"	{ Malignant degeneration occasionally.
			{ solid (rare)		
		Combined carcinoma and sarcoma.	{ Kruckenberg tumor.		

Retention cysts of the ovary	Graafian follicle cysts	Cystic degeneration of the ovary. Hydrops folliculi.
	Corpus luteum cysts	Simple Compound theca-lutein cysts.

In this classification of ovarian tumors, there do not appear some of the varieties noted elsewhere, such as unilocular, multilocular, intraperitoneal, intraligamentous, extraperitoneal, etc. However, it will be at once observed that these adjectives refer to the minor physical characteristics and to position. Thus, a unilocular cystic tumor may originally have been a glandular cystomata of the ovary in which all the septa have broken down so that all the cystic cavities have become merged into one, or it may be a parovarian tumor. A multilocular cyst may belong to the glandular cystomata, or it may be a dermoid. An extraperitoneal or an intraligamentous tumor is usually a cyst of the parovarium, but it may be a teratoma. These descriptive terms are, therefore, not pertinent to the classification of ovarian tumors in family groups or upon an etiological basis.

EPITHELIAL NEW GROWTHS

The benign epithelial new growths of the ovary commonly exhibit a massive proliferation of glands with retention of the excretory products and the formation of cystic spaces. These are the glandular cysts, adenocystomata of the ovary. Secondly, malignant degeneration may take place in them, and is most likely to affect certain types, as will be noted later. The malignant epithelial new growths of the ovary commonly exhibit the structural characteristics of an adenocarcinoma. The glandular formation is considerably in evidence, so that the tumor is semi-solid or cystic. Infrequently the tumor is nearly solid.

Glandular Cysts—Etiology.—Adenocystomata are the commonest new growths of the ovary. In what structures they originate is a matter of speculation.² Three theories deserve especial consideration. The first is that they spring from the granulosa cells of the Graafian follicle; the second is that down-growths of the germinal epithelium from the surface of the young ovary become snared off in the stroma of the ovary and later in life develop into glandular cystomata. The third, and the one which seems most likely, is that glandular cysts of the ovary arise from embryologic remains of the Wolffian tubules, the pseudomucinous tumors from the secreting and the serous tumors from the collecting tubules. The latter theory is the one suggested by Clark³ and is based on MacCallum's notes on the Wolffian system.

Pathology.—An adenocystoma arises within the substance of the ovary and in the course of its growth destroys the ovary. The growth is usually intraperitoneal and is not covered by peritoneum, so that the surface of the tumor is dull white in color, corresponding to the appearance of the tunica albuginea. Exceptionally the growth may be partly intraligamentous, and in that event the corresponding area of the tumor will be covered with peritoneum. Glandular cystomata almost always reach the size of the foetal head before they attract attention; exceptionally they may be

² In accounting for the origin of ovarian cystomata, the pseudomucinous tumors, because of the dissimilarity between their epithelium and that normally found on the surface or in the follicles of the ovary, have been ascribed to a particular origin. Possibly the most plausible theory is that pseudomucinous cystadenomata are in reality teratomata in which the characteristic glandular structures overwhelmingly prevail (Hanan, Pfannenstiel, Pick, Frankl). It is believed that the serous cystadenoma arise from the germinal epithelium and from isolated downgrowths of the same, or from the follicle epithelium (Doran, Waldeyer, Williams, Walthard.).

³ Clark discusses the four theories relative to the etiology of glandular cysts of the ovary. These tumors have been thought to arise: First, from Pflüger's tubules. Secondly, from Graafian follicles. Thirdly, from detached portions of Müllerian ducts. Fourthly, from remains of Wolffian body. Clark does not believe in the first theory, but adheres to Waldeyer's theory that the germinal hillock is first divided into ova compartments by outgrowths of connective tissue, shooting upward from the underlying Wolffian body into the mass of epithelium, and that these compartments are ultimately subdivided into the primitive follicles. He does not believe in Pflüger's tubules as the point of origin of glandular cysts, nor does he believe that the cells of the Graafian follicles can undergo such a metaplasia as would be necessary to cause them to change not only their morphology, but also their physiology. He does not believe in the development of the glandular cysts from the detached portions of the Müllerian ducts.

Clark then describes a case, a woman aged fifty-five, in which at operation he found a multilocular ovarian cyst; in the opposite ovary he found at the hilus a number of small cysts which, after serial study, he concluded from their location, etc., could only represent

found when appreciable enlargement of the ovary is just beginning. Usually, however, they present themselves as tumors of large dimensions filling the pelvis and the lower abdominal cavity. They sometimes grow to enormous proportions, tumors weighing eighty pounds having been reported. They grow with comparative rapidity even when not malignant, and are limited only by the size of the individual and the nourishment she can furnish. In mammoth tumors the weight of the host may be considerably less than the weight of the tumor. As the tumor increases in

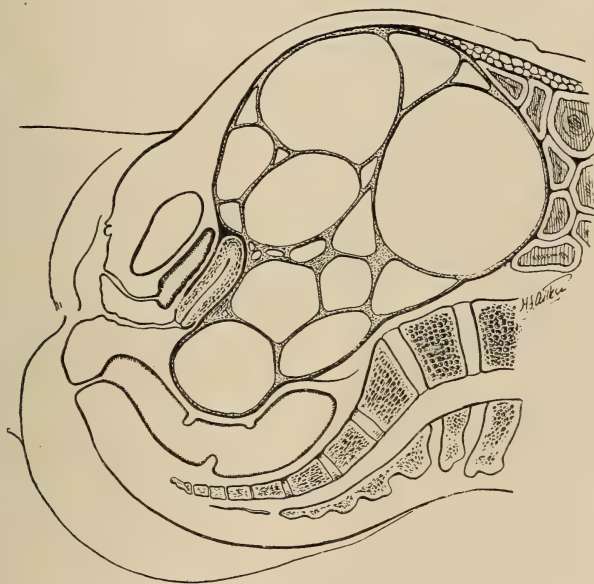


FIG. 363.—Sagittal section showing displacement of small uterus by large multilocular cyst.

size, the patient usually slowly emaciates, the parasitic growth taking from her strength and sustenance. As the ovary enlarges, it exerts traction upon the posterior surface of the broad ligament and forms a pedicle consisting of the upper part of the broad ligament, the mesosalpinx, the tube, and some-

a beginning cystic dilatation of the remains of the Wolffian body. He makes the following résumé:

First, in the broad ligaments of the adult woman the Wolffian duct and its collecting tubules are represented by the so-called Gärtner's duct and the parovarian tubules.

Secondly, if MacCallum's excellently reconstructed tubular system of the Wolffian duct is correct, the secretory portions of the tubules must be accounted for in the adult ovary.

Thirdly, the origin of multilocular glandular ovarian cysts is much more rationally explained upon the basis that they spring from these embryonic remains of the secretory system than from pathologic changes occurring in the Graafian follicle, or in the remains of the so-called Pflüger's tubules.

Fourthly, the case above described shows a glandular secretory tubular system which strongly suggests in its devious ramifications that described by MacCallum as the secretory portion of the Wolffian tubules.

Fifthly, at various points in this tubular system dilatations forming loculi are noted, suggesting the theory that multilocular glandular ovarian cysts arise from outgrowths of these embryologic remains of the secretory portions of the tubular system of the Wolffian body.

times a part of the round ligament. The tube is not otherwise affected, but retains its normal size and relation to the ovary. Glandular cystomata at first lie within the true pelvis, but later unless adherent, as they increase in size, they rise above the pelvic brim and distend the abdomen. During the time they occupy a pelvic position they displace the uterus to one side and to the front of the pelvis; when they are large enough to distend the abdomen they may pull the uterus above the pelvic brim. In



FIG. 364.—Multilocular cystadenoma of the ovary. (Gynecological Laboratory, U. of P.)

the largest tumors the pelvis is usually filled by one pole or lobulation of the cyst. The tumors are usually globular or spherical in shape, sometimes ellipical. The surface is somewhat irregular, the growth presenting a lobulated appearance; the smaller lobes give some irregularity to the surface and represent the denser part of the tumor; the larger lobes have a smoother contour corresponding to the larger cystic areas. On section the tumor is seen to be made up of cystic spaces of varying size. Usually there is one large cavity, the "mother cyst," and a number of smaller cavities, the

"daughter cysts;" the mother cyst formed by the rupture of the septa and the coalescence of neighboring daughter cysts. The relative proportion of

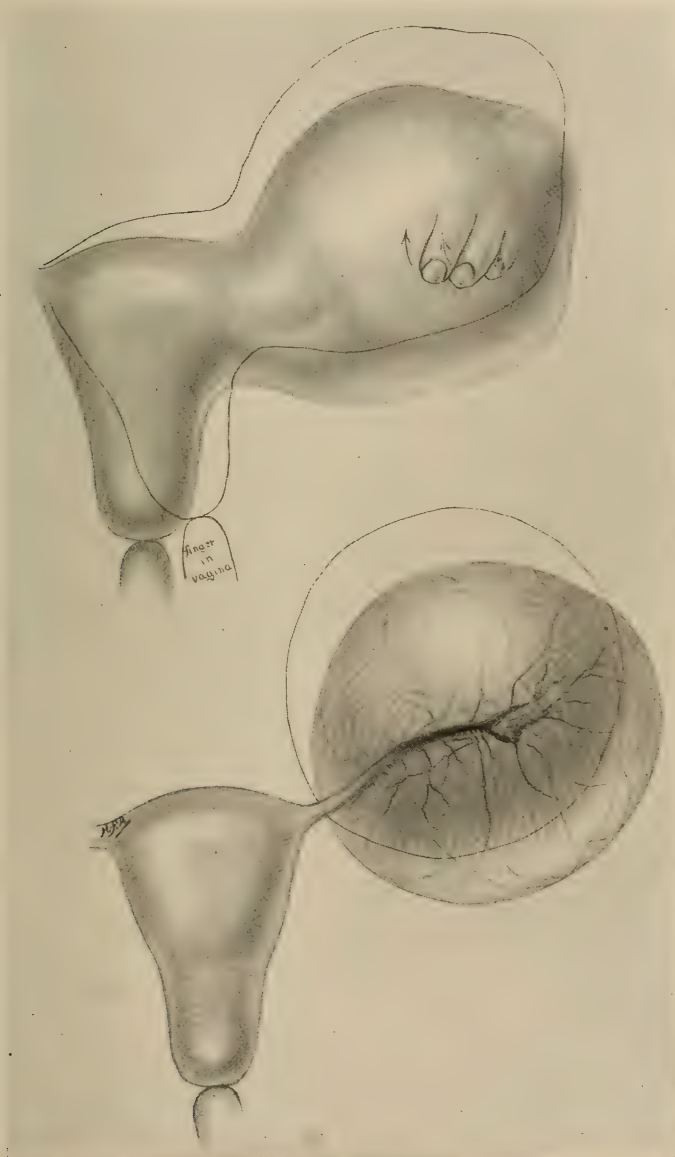


FIG. 365.—Diagram showing the difference in effect upon the cervix when a solid tumor of the uterus and a cystic tumor of the ovary is lifted or pushed up.

the growth made up of the larger and smaller cystic spaces varies considerably. It may be that none of the cystic cavities are of large size, so that the growth externally has more of the characteristics of a semi-solid than of a

cystic tumor. Exceptionally all the cysts may have coalesced into one, so that the cyst is composed of a single loculus in the walls of which the remnants of the broken-down septa between the original smaller cysts may be discerned.

The contents of the cysts vary according to the type of epithelium lining the cystic spaces and glands, and according to the accidents which have occurred in the life of the tumor. The glandular epithelium in a majority of glandular cystomata is of the high columnar goblet type and secretes a thick, glairy, semi-opaque, tenacious fluid, spoken of as pseudomucin.⁴ This variety of the adenocystomata is known as pseudomucinous. In other adenocystomata the epithelium is of the low columnar or cuboidal type, and the cyst contents are thin and watery; these tumors are spoken of as serous adenocystoma. Cellular débris from disintegrated septa may be found in the cyst content, and the fluid may be chocolate colored from admixture with blood.

Pseudomucinous cysts are supposed to develop from rests of the glomeruli of the Wolffian system, whereas serous cysts are derived from the excretory tubules. As a matter of fact, many tumors contain both varieties of cells and contents, although one or the other variety usually predominates. The true pseudomucinous cysts are invariably multilocular, whereas the pure serous cysts occasionally may be unilocular.

Serous cystomata are more inclined to papillomatous formation (*vide infra*).

Papillomatous cysts most frequently become malignant.

Glandular cysts of the ovary, unless complicated by inflammation or malignancy, do not form adhesions.

Symptoms.—Glandular cysts of the ovary may present few or no subjective symptoms until they are sufficiently large to distend the abdomen. There may be some abnormality of the menstrual periods from destruction of the follicles and interference with the formation of the corpora lutea. But these symptoms are by no means constant and are frequently disregarded by the patient. Very often the first intimation the patient has that anything is wrong comes from the realization that the abdomen is gradually increasing in size. Not infrequently the patient relates that she first noticed that her clothes seemed tight and this drew her attention to her increase in girth. As the abdominal distention becomes greater, there is a certain amount of abdominal uneasiness and distress due to displacement of the intestines, and there may also be considerable respiratory embarrassment from pressure upon the diaphragm. If the tumor reaches colossal proportions the patient emaciates and in time presents a weakened facies. In the most extreme cases the tumor may weigh as much as, or more than, the patient; there is then marked cardiac and respiratory embarrassment, general weakness, difficulty in locomotion, and œdema and varicosities of the lower limbs and abdominal wall. Glandular cysts of the ovary which are complicated may

⁴ Pseudomucin. The semifluid content of some ovarian cysts is called pseudomucin or albumin. It is similar in some ways to mucin, but it is easily split by boiling with acid so as to produce a carbohydrate, a glycoproteid, which will reduce copper (Fehling). Pseudomucin is not coagulated by boiling or by the addition of mineral acid, as is mucin, nor is it precipitated by acetic acid as is mucin. Pseudomucin is precipitated by alcohol; albumin is not.

give rise to symptoms of a very different character from those described (see Complications of Ovarian Tumors, page 405).

Diagnosis.—A glandular cyst of the ovary, which has not reached sufficient proportions to cause abdominal enlargement and is uncomplicated, is felt as a globular, freely movable tumor to one side of or behind the uterus. The uterus is displaced anteriorly and to the opposite side. The tumor and the uterus can be separated bimanually. The tumor is elastic or semi-fluctuant, and may be pushed upward without elevating the uterus (Fig. 365) (see Differential Diagnosis of Myomata, page 308); the ovary cannot be felt as a separate body on the affected side. An ovarian cyst of this size, when adherent, may closely simulate a subperitoneal myoma, especially if the capsule is thick and the cyst is tensely filled. Fluctuation in the ovarian tumor may then be indistinguishable and differentiation from a myoma nearly or quite impossible. The diagnosis will be simplified when other fibroid nodules can be felt attached to the uterine body. In such cases an effort should be made to distinguish the ovary on the affected side, and to determine, as accurately as possible, the length of the endometrial cavity; whereas the uterus, which is the seat of a myoma, is almost invariably elongated; its length is usually unaffected by an ovarian cyst. It may be necessary, in order to determine this point precisely, to pass a sound into the uterus; if surgical relief has been elected in a given case, such means of exact diagnosis may be left until the time of the operation.

The differentiation between *uterine myoma* and ovarian cysts causing abdominal enlargement is usually easy. The myomatous uterus is less likely to occupy a median position; there is almost always a certain amount of asymmetry and difference between the two sides; the surface of the growth is much more irregular, the consistency decidedly greater, and there is no fluctuation. If one or more hard, pedunculated nodules can be distinguished on the surface of the growth, it is almost *prima facie* evidence of myoma. The abdominal wall over the tumor rises to its summit abruptly, giving the abdominal parietes the appearance of being bodily pushed forward by an underlying, unyielding, irregular body. The ovarian tumor is in the median line, unless adherent; it is usually of larger dimensions than the fibroid; the abdominal wall above the tumor rises gradually to its summit; enlargement of the abdomen is usually quite symmetrical; the tumor is semi-elastic to the touch, presents signs of fluctuation, and is less apt to show surface irregularities. Over both uterine myomata and ovarian cysts dulness may be elicited by percussion, and surrounding the enlargement, except at its pelvic attachment; that is, above the symphysis, there is an area of resonance spoken of as *coronal resonance*.

In differentiating between ovarian cysts and *pregnancy*, an attempt should be made to outline the body of the uterus as distinct from the tumor; in cysts of small or moderate size, this may be readily accomplished; in tumors of larger dimensions it may be difficult or impossible. Under such circumstances lack of the symptoms and signs of pregnancy may be sufficient to exclude that condition. Pregnancy after the fifth month can be recognized by the foetal movements and the foetal heart sounds, and it is at this period that the signs are most valuable, for ovarian tumors corresponding in size

to the earlier months of pregnancy can be more readily separated from the uterus on bimanual palpation than the larger growths.

From *tympanites* and an *accumulation of fat*, ovarian cysts may usually be distinguished by the fact that there is no definite or distinctly outlined tumor mass, that the percussion over the most prominent part of the abdomen is resonant or tympanitic, that cathartics and enemas diminish the enlargement in the case of tympanites, and that there is no true fluctuation. In a very fat abdomen there may be a wave on percussion, but this can usually be eliminated by the familiar method of applying the ulnar edge of the hand to the median line.

An ascites may be quite difficult to distinguish from an ovarian cyst when the abdomen is completely filled with fluid. In the presence of mod-



FIG. 366.—Early parovarian cyst. (Gynecological Laboratory, U. of P.)

erate ascites, the differential diagnosis is quite easy, because, when the patient is in the recumbent position there is bulging of the flanks, and the percussion note over the center of the abdomen is tympanitic, whereas in the flanks it is dull. The areas of dulness and resonance are altered by a change in the position of the patient; that is, the dulness will disappear in one flank when the patient is turned and lies upon the opposite side, or, if the patient is made to stand erect, there will be dulness in the lower and resonance in the upper part of the abdomen. These differential signs are modified, however, when the ascites is sufficient in amount to completely distend the entire abdomen. In such cases there may be dulness over the entire abdominal surface, and a very distinct wave of fluctuation from one side to the other of the abdomen. If the ascitic fluid is not encysted there may be no resonance on percussion anywhere over the abdominal surface. If, as in case of ascites complicating peritoneal carcinomatosis or tuber-

culous peritonitis, the intestines are matted together and pushed to the periphery, so that they give coranal resonance, the simulation of an ovarian cyst may be almost absolute. In some cases a distinguishing feature between ascites and ovarian cyst is the recognition of peristaltic sound uniformly over the entire abdomen. In an ovarian cyst of large dimensions, these sounds would not be markedly audible over the greatest prominence of the tumor. Ovarian cyst with ascites may be suspected when, in addition to a fluctuating central tumor, there is a bulging of the flanks and a dulness over that region which is altered by change of position. Ascites may be expected in any case giving evidence of carcinomatous complications.

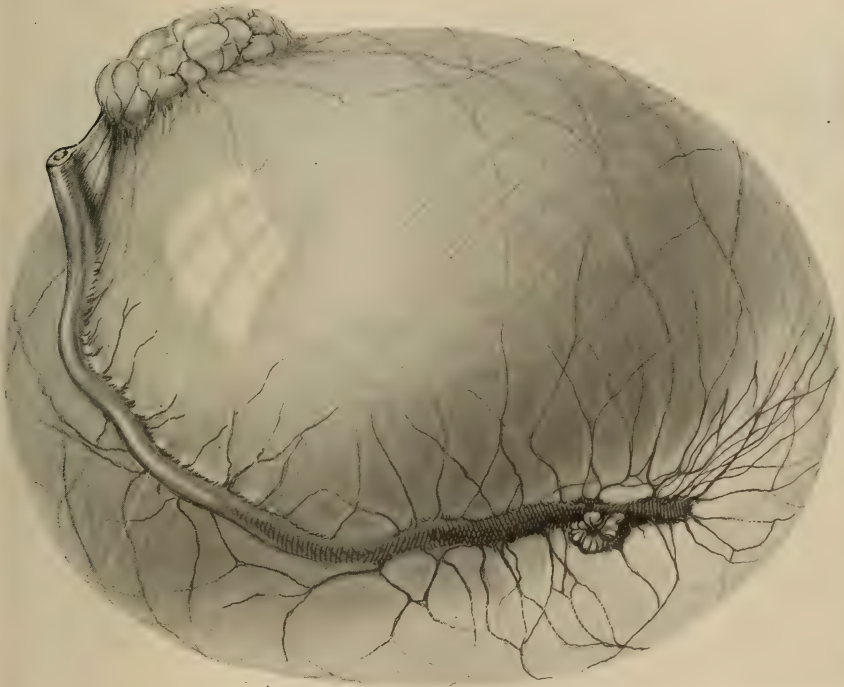


FIG. 367.—Parovarian cyst. (Gynecological Laboratory, U. of P.)

Parovarian Cysts.—Parovarian cysts are closely allied to ovarian cysts; they are epithelial new growths which in their etiology, symptomatology, and treatment resemble ovarian cysts; they spring from the remains of the collecting tubules of the Wolffian system which lie between the layers of the broad ligament. The epithelium is almost invariably of the low columnar or cuboidal type, and the contents are serous. These cysts are usually unilocular, and, as they originate from the parovarium, are therefore extraperitoneal and intraligamentous, and are covered by peritoneum (Fig. 367). They grow to a considerable size, sometimes filling the entire abdomen, but they are less likely to be of gigantic proportions than the glandular cyst of the ovary proper. In their growth they are more or less restricted by the

boundaries of the broad ligament, being resisted by the uterus on the inner side, the floor of the pelvis below, the pelvic wall on the outer side, and the attachment of the ovary to the tube and the infundibulo-pelvic ligament above (Figs. 366 and 367). During their growth they cause a displacement of the uterus to the side opposite that from which they spring, and an elongation of the Fallopian tube of the same side. The ovary itself is usually affected only by the pressure which is brought to bear upon it by the growing cyst, the ovarian tissue proper not being invaded or destroyed by the growth (Fig. 373). These cysts are almost invariably unilocular. When they reach a large size they are more distinctly and uniformly fluctuating than cysts of the glandu-



FIG. 369.—Fibroma of ovary with partial intraligamentous development causing elongation of the tube.
(Gynecological Laboratory, U. of P.)

lar type, and they have a pedicle formed by the broad ligament, the round ligament, and the tube.

Symptoms.—Parovarian cysts occasion more symptoms in proportion to their size than glandular cysts of the ovary. This is because they develop between the layers of the broad ligament (Fig. 368) which holds them in the pelvis, and between the uterus and the pelvic wall of the affected side (Fig. 373). The pressure upon the vessels and nerves of the broad ligament and upon the ureter of the diseased side, the flattening and displacement of the ovary, and the elongation and stretching of the tube, infundibulo-pelvic, and utero-ovarian ligaments may give rise to symptoms at an early stage. The symptoms consist of dull pain in the lower abdomen, back, or thighs; disturbed menses, usually dysmenorrhœa and menorrhagia; bladder irritability, frequent and painful urination, constipation, etc. The

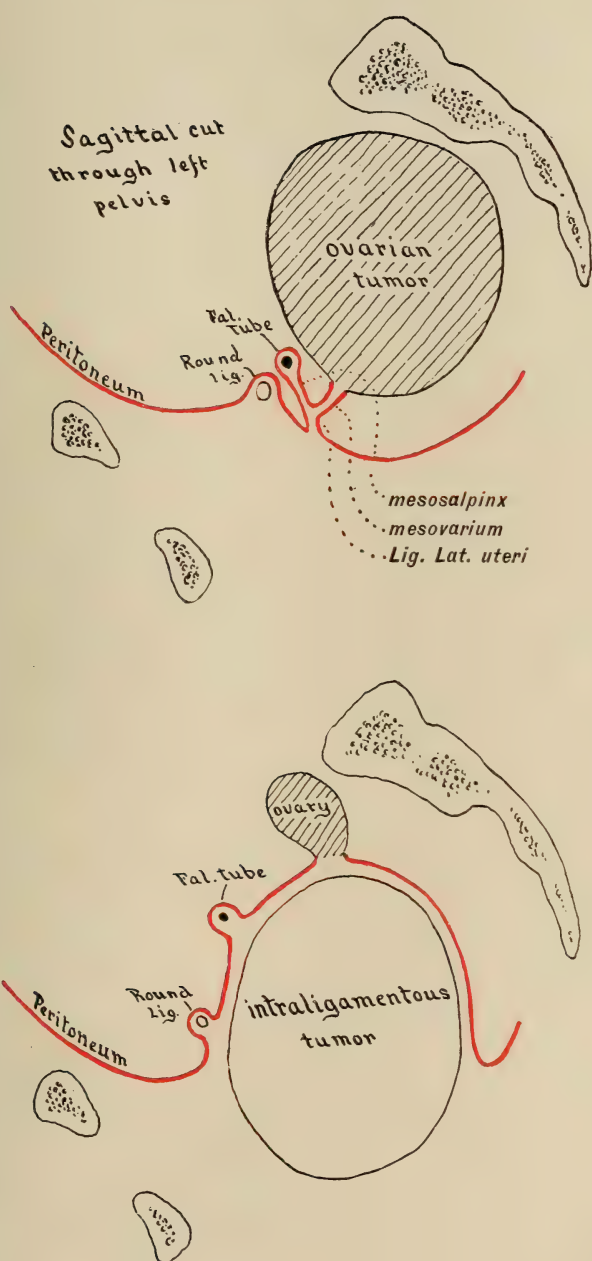
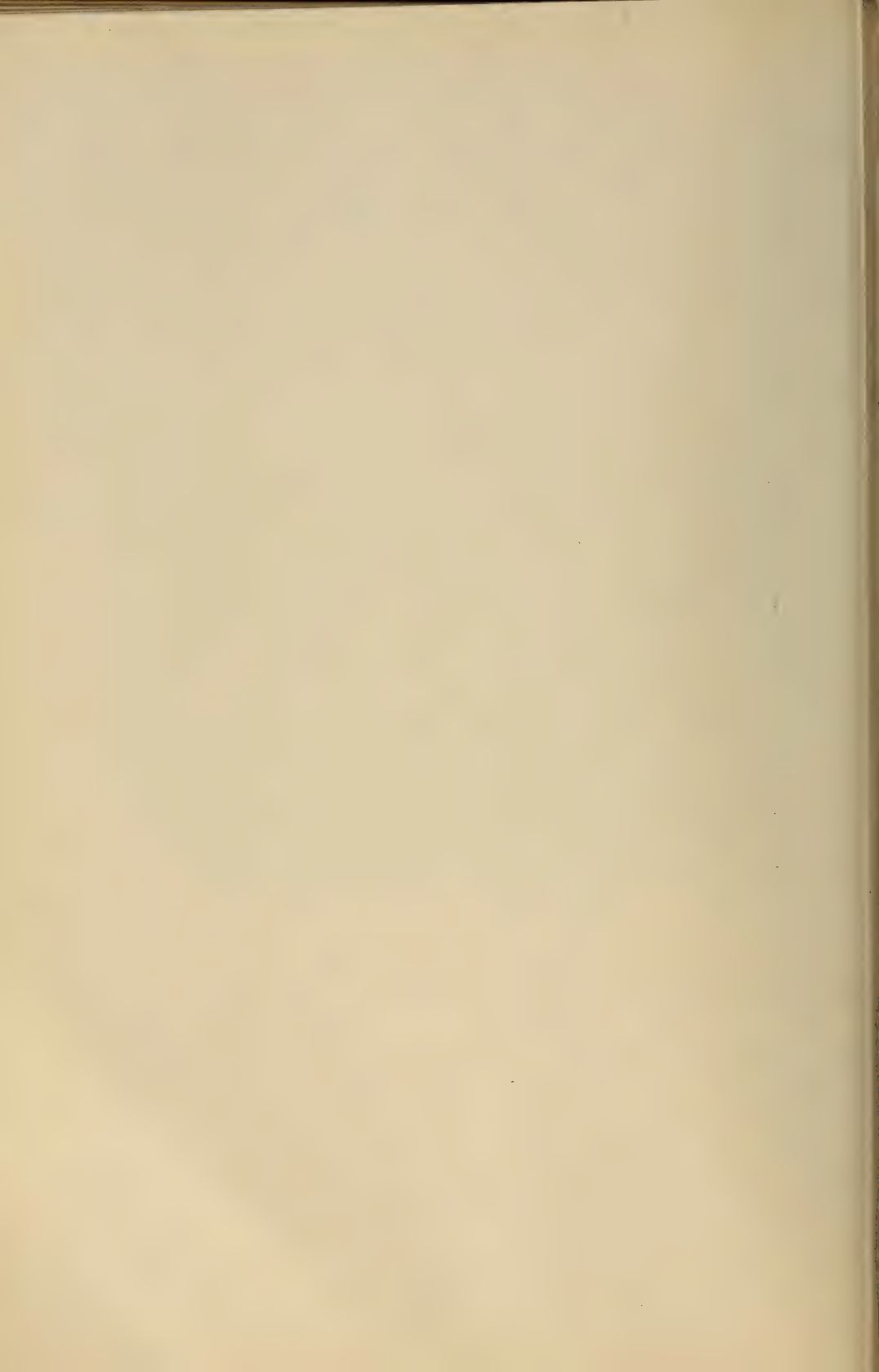


FIG. 368.—Diagram showing intra- and extraperitoneal position of cysts.



severity and predominance of some of these symptoms above others depend upon the size of the tumor, the associated condition of the pelvic organs, and the individual peculiarities of the host. After a time, to the symptoms already mentioned, abdominal enlargement is added. Very rarely there are no symptoms until the tumor rises above the pelvic brim.

Diagnosis.—The differential diagnosis of parovarian cysts from myomata of the uterus presents more difficulties than is the case with glandular cysts of the ovary. A parovarian cyst may be so tense and so intimately blended with the uterus as to be indistinguishable before exposure from a soft myoma. The detection of true fluctuation here may be the chief distinguishing feature, and this is best elicited by the trimanual method of percussion (see page 130). Palpation of the ovary upon the surface of the cystic parovarian tumor may differentiate the parovarian from the ovarian cyst; and the recognition of the ovary entirely free and separate from a lateral tumor of the uterus, on the same side and of doubtful consistency, may distinguish a myoma. A parovarian cyst large enough to cause abdominal distention presents most of the features of the glandular ovarian cystomata already given. Parovarian cysts of this size are usually very thin walled, regular in contour, and on palpation the resemblance to a tense ascites is very marked; the distinguishing feature in such a case would be the resonance surrounding the parovarian tumor (see also Chapter VIII, page 136).

Papillomatous Cysts of the Ovary and the Parovarium.—A particular type of cyst, affecting either the ovary proper or the parovarium, is marked by the growth of wart-like masses, known as papillomata (Fig. 370). These papillomatous growths have a particular import in the ultimate state of the cyst, in the clinical symptoms, and in the prognosis; in other words, a papillomatous cyst is always more of a menace to its host than a glandular cyst, because of its tendency to undergo malignant degeneration, and this occurs in about 50 per cent. of cases.

Papillomatous growths may make their appearance in either ordinary glandular cystomata of the ovary of the serous type or in the cysts of the parovarium; or, it is alleged by some, even in the germinal epithelium of the Graafian follicle. They more commonly affect the ovary. Glandular ovarian or parovarian cysts, which become papillomatous or are papillomatous in the beginning, usually do not reach as large a size as the other forms. Papillomatous involvement usually takes place before the cyst has exceeded the size of an orange. Papillomatous cysts are much more frequently bilateral than unilateral; they are not likely to contain cystic cavities of large size when they affect the ovary proper; they are usually unilocular and of larger dimensions when parovarian in origin; they are more likely to be solid or semi-solid when in the ovary proper; they cause the death of their host with much more rapidity than do the other varieties. The papillomatous growth may begin either within the cyst or upon its outer surface (germinal epithelium). When the first appearance is within, the papillomatous masses sooner or later penetrate the wall of the cyst and involve its outer surface. After the wart-like growths become intraperitoneal, implantations occur upon neighboring parts of the peritoneum, intestine, omentum, or mesentery; ultimately, the entire peritoneal cavity becomes involved.

It is said that extension of the papillomata to surrounding parts may take place without any malignant change in the papillomatous growth, and cases have been recorded in which, after the pelvic disorder was extirpated, papillomatous metastases on the peritoneum, or the abdominal organs, underwent regression and disappeared. It is quite likely that in many of the cases in which general involvement of the peritoneal cavity occurs there is a carcinomatous degeneration of the papillomata, although this may be more or

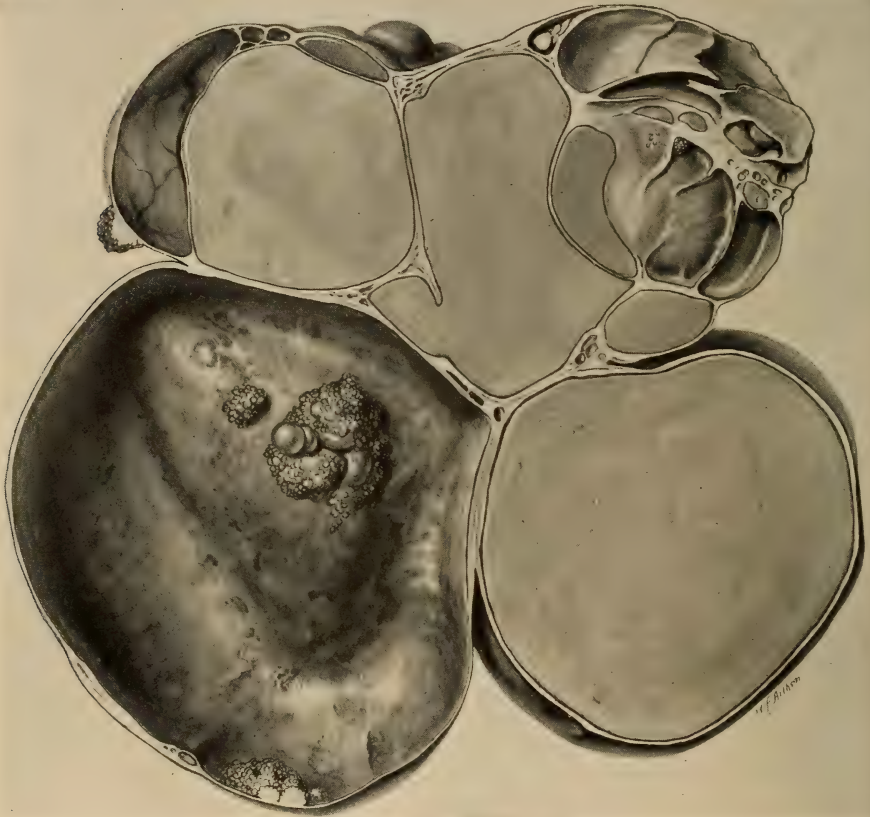


FIG. 370.—Papillomatous cystadenoma of ovary, with carcinomatous degeneration in largest loculus. (Gynecological Laboratory, U. of P.)

less confined to individual areas, and may possibly escape histologic examination unless sections are taken from every part of the growth. They are much more apt to be accompanied with ascites, on account of the peritoneal irritation which they cause than are other forms of ovarian tumors. Rupture of a papillomatous cyst is especially injurious because of the danger of implantation of the warty growths throughout the abdomen. The irregular surface of papillary masses is sometimes felt through the vaginal vault.

Symptoms of Papillomatous Tumors of the Ovary or Parovarium.—There are no characteristic symptoms of papillomata. The subjective indi-

cations of their presence are more prominent than those of glandular cystomata of the ovary, or simple parovarian cysts; ascites is more commonly present, and emaciation and weakness are more likely to be prominent features. The growths are found on both sides of the pelvis. Bimanual examination reveals pelvic masses of moderate size which give the impression of being irregular and firmly fixed. Occasionally, however, the wart-like outgrowths may be definitely recognized (see Malignant Degeneration of Ovarian Tumors, page 407).

Carcinoma of the Ovary.—Carcinoma of the ovary may be primary or secondary. The secondary carcinomas are either degenerated ovarian cysts or metastatic tumors from primary foci in the stomach, breast, intestine, gall-bladder, and uterus. Carcinomata of the ovary are more frequently secondary than has been commonly supposed. Primary carcinomata may be developed from epithelial inclusions derived from the Wolffian system. It is said that they may also originate in the germinal epithelium. Carcinoma of the ovary has a decided tendency to become bilateral. The tumors vary in size from that of a fist to that of a child's head. They are usually semi-solid, and on section present a honeycomb appearance—a meshwork of connective tissue, enclosing carcinomatous epithelium in solid plugs or in the form of glands filled with broken-down tissue and products of degeneration, of a cheesy or butter-like consistency. The size of the cystic spaces varies considerably, and there is often one space larger than the others. When the cystic feature is noticeable, the tumor is spoken of as medullary; if the solid areas predominate, the tumor is classed as scirrhus. The surface of the tumor may be nodular or fairly even, and is often free from adhesions in the early stage. Before the tumors have reached any considerable size, the carcinomatous cells penetrate the capsule of the tumor, reach the surface, and then rapidly involve the general peritoneum. Ascites and secondary carcinomatous tumors of the omentum, mesentery, intestine, and parietal peritoneum rapidly make their appearance. A fatal termination is usually not long deferred, due to the rapid growth of the original tumor, as well as to metastasis.

Symptoms of Carcinoma of the Ovary.—Carcinoma of the ovary is the most insidious disease of the generative tract. In a large majority of cases the patient does not come under observation until she is incurable. A logical conclusion from this statement, and a fact borne out by clinical experience, is that there are often very few early symptoms. Frequently the first indication the patient has of anything wrong is an increase in size of the abdomen. The increase is due to the ascites and the secondary carcinomatous masses in the omentum. In such unfortunate cases careful questioning will usually show that for some time there has been lower abdominal and pelvic pain and some disturbance of the bladder and bowels. There are usually no menstrual symptoms, as the patient has passed the menopause. In younger women there may be some menstrual irregularity and menorrhagia. When the disease is advanced there is abdominal enlargement, pelvic and lower abdominal pain and soreness, constipation, and digestive

disturbance. The patient loses weight and strength rapidly. Pelvic examination in such a case discovers irregular, indurated masses in Douglas' pouch; the bases of the broad, uterosacral, and uterovesical ligaments feel thickened and indurated; the cervix is small and fixed; it may be impossible to outline the body of the uterus, as satisfactory bimanual examination is prevented by the ascitic distention. The abdomen may be distended uniformly, or the lower abdomen may be principally or exclusively affected. In the first case the ascitic fluid is free; in the second it is encysted and surrounded by a wall of carcinomatous omentum, intestine, and parietal peritoneum. In either case irregular indurated masses may be palpated through the abdominal parietes. Fluctuation may be present over the entire abdominal tumor, or it may be limited to certain areas. If the ascitic fluid is encysted, there is dulness over the summit of the abdominal enlargement and resonance or tympany surrounding it. When the ascitic fluid is free and the abdomen is not tensely filled, there may be tympany in the center of the abdomen with dulness in the flanks and above the pubes. The areas of dulness change with the position of the patient (see also page 134).

CONNECTIVE-TISSUE NEW GROWTHS

The connective-tissue tumors of the ovary may be classified as benign, fibromata, or malignant—sarcoma, endothelioma, perithelioma. Connective-tissue tumors of the ovary are much less frequent than cystic tumors.

Fibromata of the Ovary.—Fibromata of the ovary are not frequent. The smaller ones are localized projections of ovarian stroma caused by a cicatricial contraction at the site of a previously existing corpus luteum. Fibromata of a larger size are due to a real proliferation of the ovarian connective tissue, and involve the entire ovary (Fig. 369). They may become very large, even as large as a pregnant uterus at the sixth month. They vary considerably in gross appearance. Usually they are rather dense, the capsule is whiter than that of a uterine fibroid, and, on section, the tumor exhibits areas of cystic degeneration or necrosis. Fibromyomata are less frequent than pure fibromata, and have in addition to fibrous tissue a few muscle-fibers. Both fibromata and fibromyomata are usually unilateral. Sarcomatous degeneration of the spindle- or the round-cell variety of fibromata has occasionally been found. The symptoms they produce are usually due to mechanical conditions brought about by weight and pressure. Because of the irritation which the tumor produces by rubbing the peritoneum in its vicinity, there is often an ascites. A solid tumor of the ovary, according to some authorities, is subject to torsion more frequently than other forms of tumor. It gives the same physical signs and symptoms as a cystic tumor of a corresponding size, with the exception that it is hard and does not give fluctuation.

Sarcomata of the Ovary.—Sarcoma of the ovary is one of the rarest new growths of that organ, constituting but 2 per cent. of ovarian tumors, and 30 per cent. of these are bilateral. At times sarcoma of the ovary is secondary to sarcoma in various other organs, as the pancreas, kidney, stomach, lymph-glands, and thyroid. Sarcomata of the ovary may be of the spindle- or round-cell variety. Particular forms of endo- and peri-theliomata may occur. A

mixed tumor of sarcomatous and carcinomatous elements, often with mucoid degeneration, has been occasionally observed. This type of tumor, described by Kruckenberg, is usually secondary to gastric or mammary carcinoma.

COMBINED EPITHELIAL AND CONNECTIVE-TISSUE TUMORS

Tumors in which epithelial and connective-tissue new growth are combined belong to the teratomas. Teratomata of the ovary are commonly cystic because of the greatly preponderating amount of epithelial and glandular tissue which they contain (Fig. 371). The epithelium and glandular tissue resemble those of the skin, and, because of this structural peculiarity, such tumors are commonly spoken of as "dermoid cysts."

Dermoid Cysts of the Ovary.—The origin of dermoid cysts of the ovary has been a matter of interest and much speculation. Wilms believed that they represented the abortive development of an unfertilized ovum. He



FIG. 371.—Dermoid cyst of ovary. (Gynecological Laboratory, U. of P.)

based his theory partly upon the predominance of the ectodermoid tissues which develop earlier than other tissues in the normal fœtus. The observations of Bonnet and others have shown, however, that all these tumors contain the elements of each of the three layers of the blastoderm, and it is much more likely that they represent blastomeres which have become displaced during the early development of the ovum, and subsequently lodged within the Wolffian system which occupies a large part of the early embryo. Dermoid cysts are lined with a skin-like membrane possessing hair, sebaceous and sweat glands. Elementary maxilla, teeth, and other structures, such as ganglion cells, rudimentary intestine, cartilage, thyroid tissue, etc., are found in a thickened area of the cyst wall, or in a solid part of the tumor. This solid part usually projects into the cyst cavity, and is called the dermoid eminence. The cyst content is usually a buttery or cheesy semi-liquid material, containing the shed hair from the skin lining, and composed of the oily excretion from the shafts of the hair glands, or

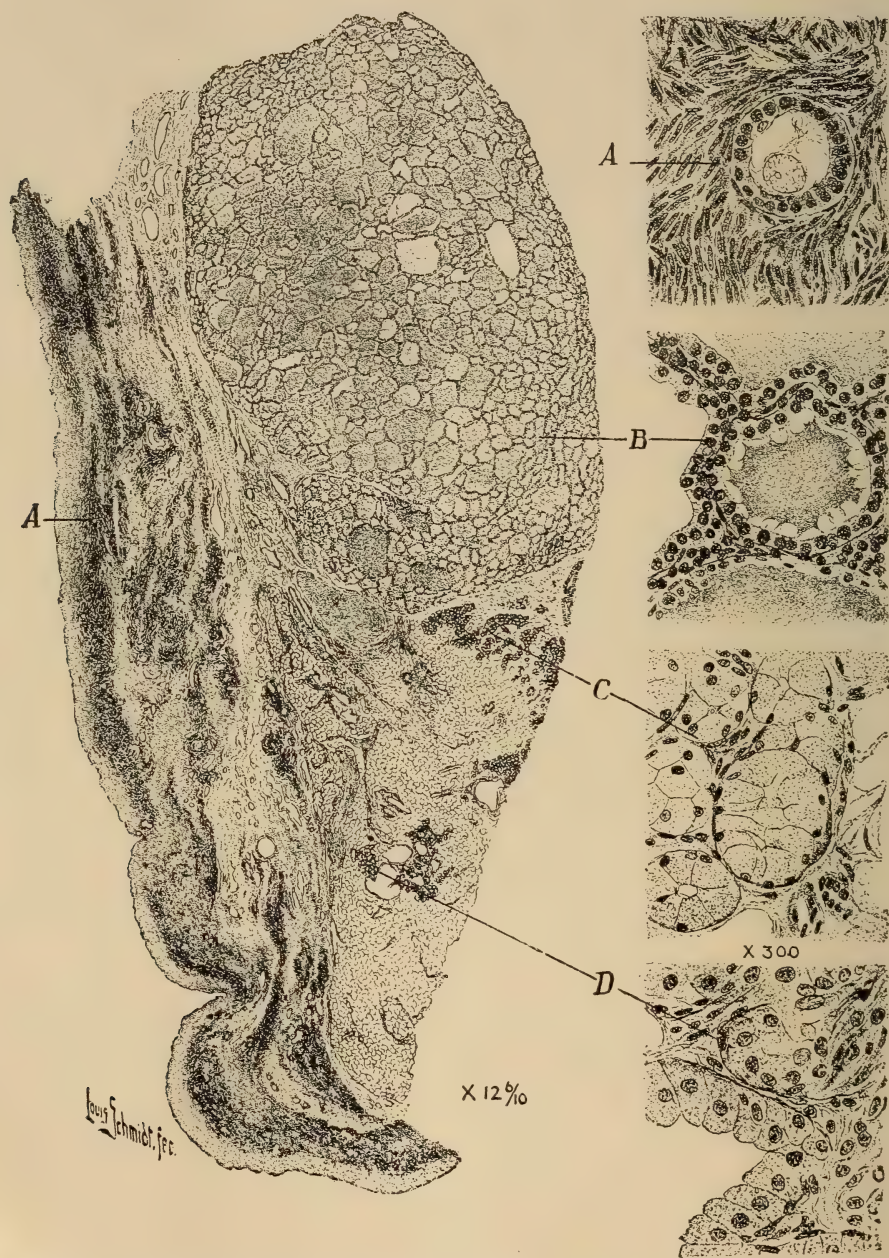


FIG. 372.—Ovarian teratoma with histologic sketches of tissue: (A) Primordial follicle in ovarian stroma; (B) struma colloidosa; (C) Mucous glands; (D) sebaceous glands. (Anspach in University of Pennsylvania Medical Bulletin.)

sebaceous material excreted by the sebaceous glands. At the body temperature this fatty content is semi-liquid, but on exposure to cold it partly solidifies, and sometimes the contents may be so thick, even at body temperature, that it is semi-solid. Dermoid tumors are usually intraperitoneal, although they may develop between the layers of the broad ligament. They are, as a rule, of moderate size, hardly ever being larger than a grapefruit, and practically never reaching the huge dimensions of the glandular cysts. Owing to the thinness of the wall and the yellowish contents, the surface of the tumor is often yellow. It may, however, be of a pearl-gray color, due either to an unusual thickness of the capsule or to whiter and more cheesy contents.

Sometimes the so-called dermoid cyst does not contain much ectodermal tissue; its structure then approaches that of the ordinary teratomata. In some tumors of this type there is a large proportion of thyroid-gland tissue; such a tumor is spoken of as *struma ovarii*, Fig. 372. Pick mentions "hydatidiform-mole-like" structures in a case of dermoid cyst. Teratomatous tumors of the ovary are the most common variety of ovarian tumor found in the young, some cases being reported before the age of puberty. They appear most often, however, during the active childbearing period, though they may make their appearance in the aged. Dermoid cysts of the ovary often occupy a position anterior to the uterus, instead of posterior, as one might expect. Dermoid cysts are often adherent, sometimes forming attachments to neighboring hollow viscera, into which they break and discharge their secretion. Rarely dermoid cysts may be complicated by the development of carcinoma in their epithelium constituents.

Symptoms.—The symptoms of dermoid cysts of the ovary are not at all characteristic, but, as a rule, they cause more disturbance in proportion to their size than the glandular cystomata. They very rarely are large enough to cause an abdominal tumor, and are evidenced more by pain and distress in the lower abdomen and back, vesical and rectal disturbance, and menstrual disorders. Dermoid cysts are more often complicated by inflammation of the surrounding peritoneal surfaces than any other of the benign ovarian tumors.

Pelvic examination may give no inkling of their true nature, the examiner progressing no further than the diagnosis of an ovarian cystic tumor. Occasionally, however, the contents being unusually thick and the cyst less tensely filled than usual, there may be a doughy sensation imparted to the examining finger.

TREATMENT OF OVARIAN NEW GROWTHS

Cystomata.—The treatment of a *cystic new growth of the ovary* should always be surgical—that is to say, as soon as the diagnosis is made, provided the general condition of the patient permits, an operation for its removal should be undertaken. Immediate, or comparatively immediate, operation is indicated for the reason that these tumors show little or no tendency to undergo a spontaneous cure, their growth is usually unlimited and unrestricted, they progressively sap the patient's strength and resistance, and they may, at any time, become the subject of accidents, such as will be described. Furthermore, carcinomatous degeneration is comparatively frequent.

The operation of removing an ovarian cyst, in uncomplicated cases, is very simple and easy. In intraligamentous cysts, however, or in those complicated by inflammation and adhesions, the operation may be extremely difficult. Usually, the operation consists of a simple median incision, evacuation of the contents of the largest cyst cavity by means of a trocar, delivery of the collapsed cyst through the incision, and ligation of the pedicle. If there is any reason to suspect malignant degeneration, or any form of infection, or, if the tumor is of the papillomatous variety, it is better to avoid puncture and aspiration, and to make an abdominal incision of sufficient length to deliver the tumor without aspirating it.

Intraligamentous tumors (Fig. 373) may sometimes present considerable difficulty in the way of operation, especially if they are of the papil-

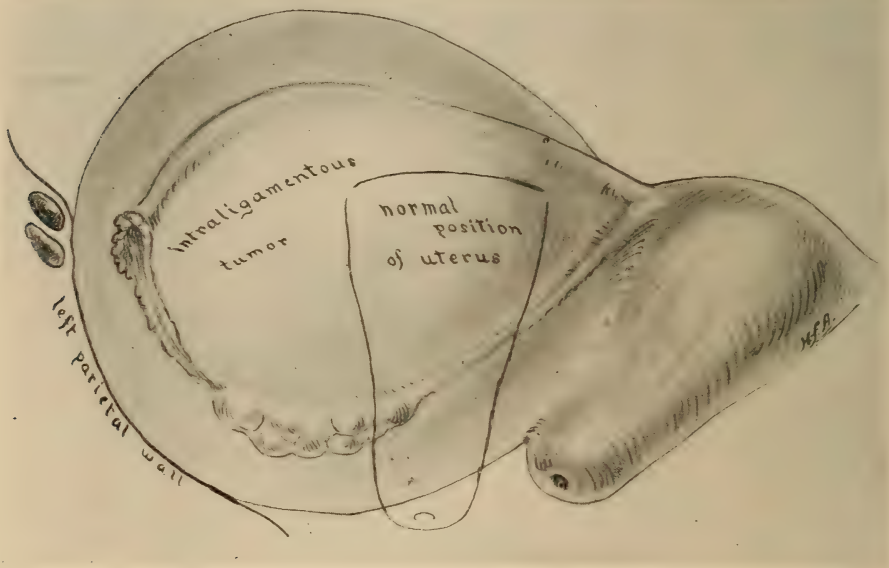


FIG. 373.—Displacement of uterus and stretching of tube in pelvic intraligamentous tumor.

omatous type, or if they are complicated by carcinomatous changes. An attempt may be made to enucleate the tumor by securing the ovarian vessels at the pelvic brim and at the uterine cornua, and then incising the peritoneum and shelling the growth from between the layers of the broad ligament. If the tumor is firmly fixed and this plan appears impracticable, and especially if the patient is approaching the menopause, a hysterectomy is advisable in order to facilitate the detachment of the lower pole of the tumor from the base of the broad ligament, the excision being started on the side opposite the growth, and the tumor itself being attacked from below, after cutting through the cervix.

The question of performing bilateral salpingo-oöphorectomy and hysterectomy in connection with the removal of an ovarian cyst is important in direct proportion to the probability of the ovary of the opposite side becom-

ing diseased. Cases have repeatedly occurred in which ovarian cysts have developed in both ovaries, in the second one a number of years after the first ovary had been removed. For this reason, in patients approaching the age of forty, it is usually advisable to remove the uterus and the opposite ovary, unless they present an absolutely normal appearance, and in women over forty, it is advisable to remove the uterus and both adnexa, whether the opposite ovary appears diseased or not.

Papillomatous tumors of the ovary are especially liable to be bilateral, and, when dealing with them, the surgeon will do well who leans to the radical side and removes the opposite ovary upon the least suspicion of involvement. In young women, if the second ovary appears absolutely normal, it may be let alone, and the case carefully watched. On the least indication of subsequent involvement another operation should be undertaken.

Operation for papillomatous tumors of the ovary will sometimes lay bare a papillomatous involvement of the peritoneum, appendix, and intestines. These papillomatous implantations or metastases are not invariably malignant, and the surgeon need not feel that the case is hopeless because he is unable to remove them. Sometimes after the papillomatous ovarian disease has been extirpated, such masses will disappear; their existence, however, always makes the outcome dubious, and the prognosis should invariably be guarded.

Ovarian tumors discovered during pregnancy should be exposed to operation. It has been shown by Norris and others that the expectant treatment of an ovarian tumor discovered during pregnancy carries a danger to the mother three times as great as that of early operation. In twenty-two cases, reported by Wiener and Cathola, removal of the tumor was followed by abortion or premature labor in but four. During the operation the parts should be handled as gently as possible, and the post-operative treatment should be like that adopted for threatened abortion. If the cyst is discovered near term, and there are no symptoms, the operation may be delayed until that time, when Cæsarean section and an oöphorectomy may be combined.

Carcinomata.—Carcinoma of the ovary in the early stage demands a complete hysterectomy and the removal of both adnexa. The entire uterus must be removed because the endometrium may show a metastatic growth, or because it is possible that the ovarian carcinoma is secondary to an unrecognized cancer of the uterine body. The opposite ovary and tube must be taken away because of the pronounced tendency of the ovary of the opposite side to become carcinomatous. If the celiotomy incision shows that there are extensions to the pelvic peritoneum, sigmoid, etc., and if supra-vaginal hysterectomy with bilateral salpingo-oöphorectomy presents no extraordinary technical difficulties, this plan should be carried out, the implantation growths upon the peritoneal surfaces being cauterized as far as practicable with the thermocautery. Some cases of papillomata answering this description have gotten well even though the surgeon has been obliged to close the abdomen, leaving portions of the growth diffusely spread upon the adjacent peritoneal surfaces and organs. It may be that the cases which terminate favorably are not carcinomatous; one can not say always from

the gross appearance of the involved areas, whether the disease is benign or malignant. Therefore, it is wise to give the patient the benefit of the doubt, remove all the diseased structures that it is technically possible to remove without running too great a risk, and then use the Röntgen ray or radium in the subsequent treatment.

In the late stage of carcinoma of the ovary, nothing is possible surgically, the masses in the pelvis cannot be extirpated with safety, and the extension of the disease to the omentum, mesentery, intestines, and visceral organs makes any surgery hopeless. Nevertheless, except in the most advanced cases, an exploratory incision should be made. Now and then a case which appears hopeless before an incision is made may, nevertheless, be saved by operation.

Fibromata.—Small fibromata of the ovary may be excised from the ovary if a healthy part of that organ is demonstrable. Large fibromata, or those in which the entire ovary is involved by the growth, demand a complete oöphorectomy. The tube may be saved if it is healthy and its conservation presents no technical difficulties.

Sarcomata.—The treatment of sarcoma of the ovaries is identical with that described for carcinoma of the ovary.

RETENTION CYSTS OF THE OVARY

In addition to the ovarian tumors that have been mentioned, cystic and solid, other tumors of the ovary of a cystic nature may result, not from an actual growth and development of epithelium, but from the retention within the ovary of fluid, which, under normal conditions, is either expelled or absorbed. They are spoken of as retention cysts, or as cystic degeneration.

Graafian Follicle Cysts.—A *simple retention cyst* of the ovary affects the Graafian follicle. It scarcely ever reaches a very large size, rarely beyond that of an orange. Occasionally, a cystic condition of several Graafian follicles in the same ovary may exist, under which circumstances, as the cysts increase in size, the intervening septa may be destroyed, so that they finally merge into one. When the cyst cavity is of considerable size and has evidently come from the distention of one, or at most several follicles, the condition is spoken of as *hydrops folliculi*. If many Graafian follicles undergo cystic degeneration coincidently, and none of them reaches a very large size, the ovary may be honeycombed with these small cystic spaces, and the condition is then termed *cystic degeneration of the ovary*.

Cystic degeneration of the ovary may be the result of a thickening of the ovarian capsule by perioöphoritic exudate or adhesions. In some cases the increased thickness and density of the capsule appear to be independent of previous perioöphoritis. Frankl believes that cystic degeneration of the ovary is the result of a premature and abortive development of a large number of follicles at the same time, induced by chronic hyperæmia (inflammation, circulatory disturbance, etc.).

A *hydrops folliculi* is usually unilocular, the outer surface being perfectly smooth and free of attachment to surrounding organs; the wall is thin and the contents usually clear serum, unless hemorrhage has occurred into the

cyst cavity, when the fluid may be a chocolate brown. The outer surface is of a dead white color, corresponding to the tunica albuginea. The unaffected part of the ovary is usually found to one side of the cyst cavity, the amount of unaltered ovarian tissue present depending upon the number of follicles which have been involved in the formation of the cyst.

A *corpus luteum cyst* (Fig. 374) results from the failure of absorption of the fluid blood in a Graafian follicle during the formation of the corpus luteum, or from a replacement of the absorbed blood by clear transuded blood serum. A *corpus luteum cyst* usually does not reach as large a size as a *hydrops folliculi*; its wall is comparatively thick, its color often purplish red or chocolate brown, although it may present the dead-white appearance of the tunica albuginea, or the yellowish color of the lutein cells. The surface of the ovary containing a corpus luteum cyst is usually free of adhesions unless infection has preceded or followed it, or the tumor has attained such a size as to cause irritation of the surrounding peritoneum.

Symptoms of Graafian Follicle and Corpus Luteum Cysts.—Cystic degeneration of the ovary, hydrops folliculi, and corpus luteum cysts are, as a rule, but a part of chronic pelvic peritonitis, the symptoms of which are detailed on page 429. The ovarian abnormalities may be the most prominent feature of the residuum of a previously acute pelvic peritonitis, the other evidences of the inflammatory process having nearly or entirely disappeared. The symptoms are menstrual disorder of some type—too frequent or delayed periods, with increase or diminution of the flow, depending upon the effect of the disease upon the ovarian secretion. The menses may be painful; the distress is usually most marked during the week of premenstrual congestion and subsides as the flow develops. Added to these symptoms periodic evidences of disorder may be manifested, such as low abdominal pain on the affected side, dyspareunia, and dyschesia.

Diagnosis.—The ovary which is the seat of a Graafian follicle or corpus luteum cyst is enlarged, possibly tender, and often fixed in position by adhesions. The uterus may be outlined and sharply defined on one side and in front. The size of the enlargement rarely exceeds that of a lemon; it is globular or spherical in shape. In exceptional cases, when the ovary is as large as an orange (*hydrops folliculi*), fluctuation may be detected. When the ovary is not adherent, a freely mobile, semi-elastic, globular tumor connected by a pedicle to the uterus is almost characteristic. If, however, the ovary is adherent, the trouble may be difficult to distinguish from a tubal enlargement, and it is not uncommon to find the tube adherent and closely attached to the enlarged ovary.

Treatment.—The attitude of the surgeon toward simple retention cysts



FIG. 374.—Corpus luteum cyst of ovary.
(Gynecological Laboratory, U. of P.)

of the Graafian follicle and the corpus luteum, and toward cystic degeneration of the ovary should be quite different from that which he must assume to ovarian new growths. These ovarian affections may be distinguished chiefly by their smaller size, although, occasionally, the diagnosis will be impossible until an abdominal incision has been made.

If two-thirds of the ovary are uninvolved, a cyst of a corpus luteum or of a Graafian follicle may be removed by incising the tunica albuginea at the junction of the cyst with the unaffected ovarian tissue, shelling out the capsule of the cyst from the ovarian stroma, and closing the raw area by approximating the sides with fine sutures. If less than two-thirds of the ovary remains unaffected, the treatment will depend upon the condition of the opposite ovary. If the latter appears to be perfectly healthy, the affected ovary should be removed; if both ovaries are about equally involved, resection should be undertaken.

The surgeon's attitude toward cystic degeneration of the ovary should differ somewhat from that toward follicular or lutein cysts. In cystic degeneration of the ovary the prognosis from resection is much less favorable than in hydrops folliculi. If but one ovary is extensively affected it will be advisable to remove that ovary entirely. If both ovaries are equally affected, and the woman is youthful, an attempt should be made to cure the patient by resecting a portion from each. In making this resection the surgeon's aim should be to make flaps which will approximate without much difficulty. The portion excised should be principally from the cortical area, and should occupy a central position, running from pole to pole rather than from side to side. In this way more of the follicle-bearing area, which is the site of the disease, may be removed, and with less disturbance to the ovarian circulation than if the hilus of the ovary is involved by the excision. The sides of the ovary should then be approximated by through-and-through sutures of fine catgut, passed with a round-pointed needle, and tied sufficiently tight to secure hæmostasis and cover up raw surfaces. The fewer sutures needed, the better will be the outcome of the case; absolute hæmostasis is indispensable to success.

Compound Theca-lutein Cysts of the Ovary—Lutein Cystoma Ovarii.—

In a large number of cases of hydatidiform mole or chorionic epithelioma, the ovary has been found to be the seat of a multilocular cystic formation, usually bilateral. The size of such cystic ovaries varies; they have been observed as large as the foetal head. The cysts resemble those derived from the corpus luteum in that the wall is made up of layers of lutein cells of varying degrees of thickness. There is also a diffusion of lutein cells in the ovarian stroma. The cyst content is fluid, semi-fluid, or opalescent, although often stained by hemorrhage. These cysts have been observed to undergo retrogression after the removal of the intra-uterine mole formation. Various speculative theories as to their origin have been advanced. Whether over-activity of the chorion epithelium produces an excess of lutein tissue with subsequent cyst formation, or whether over-activity of the lutein tissue governs the overgrowth and cystic degeneration of the chorion villi remains to be determined. No recorded specimens have shown malignant degeneration. The diagnosis is usually made by histologic examination. The majority of cases have been treated surgically.

ACCIDENTS AND COMPLICATIONS OF OVARIAN TUMORS

Cystic ovarian tumors are subject to infection, intracystic hemorrhage, torsion of the pedicle, and rupture. Solid ovarian tumors are subject to torsion of the pedicle.

Infection.—Infection of ovarian cysts is more common in the dermoid than in the other varieties, and is more frequent in tumors which have been subjected to tapping, or in those whose blood supply has been impaired by torsion of the pedicle, traumatism, or intracystic hemorrhage. Unless such predisposing causes obtain, infection is unusual. Infecting organisms may reach ovarian cysts by extension from neighboring intestine, through the Fallopian tubes, the blood, or the lymphatics of the broad ligament. Infection of ovarian cysts by the typhoid bacillus has been observed as a complication of typhoid fever. Infection is particularly apt to occur following the trauma incident to abortion or labor.



FIG. 375.—Ovarian cyst twisted on its pedicle. (Gynecological Laboratory, U. of P.)

The *symptoms* of infection of an ovarian cyst are largely those which characterize an ovarian abscess; the tumor may, or may not, have been recognized previously. If the physician or patient has been aware of its presence, there may be a demonstrable increase in size; the abdominal muscles exhibit spasm and rigidity, and on palpation the tumor itself, previously insensitive to pressure, may have become exquisitely tender. In addition, there are the general symptoms—fever, increase in the pulse-rate, possibly chilly sensations, and indications of toxæmia. There may be considerable spontaneous pain in the pelvis or abdomen.

If the tumor has been unsuspected, the existence of a cystic mass at the very beginning of the attack will be suggestive of its true nature. The physical signs and the objective symptoms previously described will furnish further positive evidence.

Acute infection of a cyst may be difficult to distinguish from torsion. As a rule, torsion is accompanied with more acute pain and less febrile disturbance, at least in the early stages. While the leucocyte count in torsion increases slowly acute infection will be accompanied by an earlier and higher leucocytosis.

Torsion.—Torsion of the pedicle of an ovarian tumor is the most frequent accident to which these growths are subject. Tumors of moderate size (lemon to a grapefruit), non-adherent, and with a smooth surface are predisposed to torsion (Figs. 375 and 376). Fibromata of the ovary become twisted with relatively more frequency than cystic ovarian tumors; but



FIG. 376.—Ovarian cyst with torsion of its pedicle. (Bryn Mawr Hospital.)

torsion of a fibroma is not often observed inasmuch as these growths are comparatively rare. Glandular cystomata are more likely to undergo torsion than any other variety of cyst; torsion is least likely to occur in parovarian cyst. This complication is not infrequent in dermoid cysts. Papillomatous and malignant cysts rarely undergo torsion, as they are usually more or less fixed and adherent. It goes without saying that any cyst complicated by adhesions cannot undergo torsion; but a cyst which has undergone torsion becomes adherent unless removed, as a result of the nutritional disturbances in its outer wall. Factors favoring torsion of the pedicle of an ovarian tumor are a tumor of moderate size and smooth surface, a roomy pelvis, and a relaxed abdominal wall. Rotation may be precipitated by the act of urination or defecation, by falls, and by sudden, excessive muscular effort.

The *symptoms* of acute torsion are sudden and severe pain in the abdomen or pelvis. The pain is usually agonizing in character, and hard to relieve. The patient may, or may not, have been conscious of a tumor beforehand. If she has been aware of its presence it may be apparent that the tumor is somewhat increased in size and has become sensitive to pressure. The pain may radiate in different directions beyond the seat of the growth and may give rise to reflex disturbance, such as nausea and vomiting. Although the temperature may be subnormal at first, before long fever makes its appearance and a moderate increase in the pulse-rate is present from the beginning of the attack. If the patient is not relieved by surgical measures the pain has a tendency, after a few days, to subside, this being the signal of necrosis of the pedicle and tumor, with the formation of adhesions about the growth, and possibly the beginning of a circumscribed peritonitis. Infection, also, may supervene.

Rupture of an ovarian cyst usually follows traumatism of some sort. It has followed a fall or a blow upon the abdomen, a fall upon the buttocks, violent straining at stool, and other causes which may suddenly increase intracystic tension. Ruptures are accompanied by the following symptoms: Sharp pain over the affected area; diminution in the size of the tumor; free fluid in the abdominal cavity, and, in some cases, symptoms of internal hemorrhage so marked, even from the rupture of a corpus luteum cyst, as to simulate a ruptured ectopic pregnancy. A number of such cases have been reported in which the true state of affairs was found only at the time of operation. The result of the escape of the contents into the peritoneal cavity depends upon the nature and complications of the cyst. A thin, serous or mucinous collection of fluid may be absorbed in the course of a few days, while a thick pseudomucinous collection in the peritoneal cavity may give rise to a foreign body peritonitis with attempted encapsulation of the pseudomucinous material. In the latter event the parietal peritoneum and serous covering of the intestine are diffusely reddened and thickened. Close examination will show minute particles of pseudomucin embedded in the thickened peritoneal coats. To this condition the name of *pseudomyxoma peritonei* was given by Werth. If at the time of rupture some of the pseudomucinous cells lining the cyst have become transplanted to the peritoneal cavity, or if the opening between the cyst cavity and the peritoneal cavity persists, the amount of pseudomucinous material may gradually increase. If the condition is unrelieved by operation, death may ensue. When papillomatous debris is discharged into the peritoneal cavity, it causes a foreign body peritonitis with, at first, attempted encapsulation and, ultimately, transplantation of the papillomata. The vegetations soon involve all the neighboring serous surfaces and may spread throughout the abdominal cavity. Papillomata peritonei become malignant in 50 per cent. of cases, and cause death in a large proportion of those affected.

Malignant degeneration of ovarian tumors is by no means rare. It is often hard to determine whether a given malignant growth involving the ovary is primary or secondary. The difficulty in making such a distinction is evident. The fact remains, however, that a considerable proportion of ovarian tumors are malignant. Norris found ten out of sixty-three cases

malignant, and judged that four of the ten were originally benign. Wiener found twenty-four carcinomata in 269 ovarian tumors; five of the twenty-four, he believes, were originally benign. Carcinomatous degeneration is particularly likely to affect papillomatous and serous cysts. In a large proportion of cases when a papillomata has extended from the ovary to the peritoneum it has already begun to undergo malignant degeneration. It is only by histological examination that early malignant changes in these tumors can be detected. In the later stages the papillomatous masses are underlain by hard plaques of infiltrating cells which invade the cyst wall. Carcinomatous degeneration of serous or pseudomucinous cysts is usually indicated grossly either by the development of papillomatous masses situated upon indurated areas in the cyst wall, or by solid areas of considerable induration which encroach upon the more cystic parts of the growth. A squamous-celled type of carcinoma is found as a complication of dermoid cysts. Fibroma and fibromyomata of the ovaries may undergo sarcomatous degeneration.

Carcinoma of the ovaries, due to metastasis from other organs, often appears after ascites and general peritoneal involvement have hidden the original tumor. The primary location of the disease may be difficult or impossible to discover. It may be found in a small carcinomatous intestinal lesion, or an unsuspected nodule in the breast. Metastatic cancer of the ovary is bilateral in 50 per cent. of the cases, according to Frankl. As a rule, it is of a scirrhus type, and is smaller than the primary medullary forms.

TREATMENT OF THE ACCIDENTS WHICH MAY OCCUR TO OVARIAN CYSTS

Torsion.—An ovarian cyst which has undergone torsion requires operative removal without delay. Any other course will expose the patient to the risk of necrosis and gangrene of the tumor, extensive adhesions, and possibly a spreading peritonitis.

Rupture.—Immediate celiotomy is indicated with extirpation of the growth; otherwise the patient is exposed to the danger of uncontrolled internal hemorrhage, and the escape of irritating malignant contents into the peritoneal cavity.

Infection.—If the diagnosis is positive, immediate operation with extirpation of the infected cyst should be undertaken. The only cases which admit of delay are those in which the tumor is small and there is difficulty in distinguishing between an infected ovarian cyst and pelvic inflammatory disease of the post-partal, post-abortal, or gonorrhœal types. If, under such circumstances, the usual palliative measures result in no improvement, an exploratory operation is justifiable.

Malignant Degeneration.—The treatment is that already outlined for carcinomatous tumors of the ovary.

MISCELLANEOUS LESIONS OF THE OVARY

Atrophy of the Ovary.—The ovary may undergo premature atrophy as the result of damage wrought by pelvic inflammatory diseases, or by the pressure of uterine or parovarian tumors. Atrophy may also follow oöphoritis caused by infectious diseases, particularly scarlet fever, parotitis,

or varioloid. In addition, it has been observed in the course of syphilis, diabetes, myxœdema, exophthalmic goiter, locomotor ataxia, acromegaly, and poisoning by arsenic and phosphorus. In some women, in the early thirties, atrophy of the ovary occurs without any apparent cause and is usually associated with a pronounced increase in adipose tissue throughout the body. In the various anæmias either primary or secondary to general diseases such as tuberculosis, the ovary may undergo atrophy. The symptoms are a gradual or sudden diminution in the menstrual flow, together with the nervous manifestations usually reserved for the menopause.

Hypertrophy of the Ovary.—The ovary may be generally enlarged without being cystic or the seat of new growths.

This condition is most often observed in connection with fibroid tumors of the uterus.

Hernia of the Ovary.—The ovary may occupy a place in a hernial sac. This is most common in connection with inguinal hernia, but may occur in the femoral or the obturator varieties. The hernia is often congenital. The displacement of the ovary may be bilateral. In the course of time, adhesions may occur between the ovary and the sac; the ovary, being unnaturally exposed to traumatism, may be injured, so that interstitial hemorrhage, inflammation, and solid or cystic hypertrophy may occur. The distinguishing feature of the hernia is the sensitive mass which is commonly irreducible, swells at each menstrual period, and at that time becomes unusually painful. The diagnosis is facilitated by finding the fundus of the uterus inclined toward the side of the hernia. The treatment is always surgical, and consists in freeing the ovary from the hernial sac, dividing the hernial ring, replacing the ovary, and performing the usual radical operation for the cure of the hernia. In some cases it is impossible to free the ovary without seriously damaging its surface to such an extent that if it were replaced within the abdomen, adhesions or other pathological processes would be sure to occur. Under such circumstances the ovary must be extirpated.

Prolapse of the Ovary.—Prolapse of the ovary is usually a mere accompaniment of a backward displacement of the uterus. Rarely it may be independent of the position of the uterus. Under such circumstances, the uterus may be in a normal position, but the utero-ovarian and the infundibulo-pelvic ligaments are elongated and relaxed. The symptoms of prolapse of the ovary are pain on the affected side, especially when the patient is upon her feet or performing some bodily exertion; pain upon defecation, and dyspareunia. Upon examination the ovary will be found lying in Douglas' pouch, where it can be readily felt by simple digital examination. The displacement of the ovary may be accompanied by displacement of the uterus, or the uterus may be in a normal position. Prolapse of the ovary, dependent upon displacement of the uterus, is cured by correcting the position of that organ. Prolapsus of the ovary occurring alone may be dealt with by the assumption of the knee-chest position regularly, and by the use of tampons, daily laxatives, and hot douches. In most cases, however, prolapse of the ovary will ultimately require some operative treatment, although uncomplicated cases of prolapse

of the ovary are very rare. The operation consists of: suspending the ovary to the round ligament by passing a suture through the mesosalpinx, catching the hilus of the ovary and the round ligament; or plication of the infundibulo-pelvic ligament. Any of the operations for suspension of uterus will correct a coincident displacement of the ovary. The Webster-Baldy operation especially is effectual.

BIBLIOGRAPHY

- ANSPACH, B. M.: "The Present Conception of Dermoid Cysts of the Ovary." U. of Pa. Med. Bull., 1903, Nov.
- BANDLER: *Die Dermoidcyste des Ovarium*. Berlin, 1900.
- BONNET: "Aetiologie d. Embryoma." *Monat. f. Geb.*, 1900.
- BRIGGS, H.: "Unilateral Solid Primary Adenoma of Ovary." *Proc. Royal Soc. Med.*, 1916, ix, 73.
- CLARK, J. G.: "The Histogenesis of Glandular Cysts of the Ovary." *Trans. Amer. Gyn. Soc.*, 1903, xxviii, 312.
- DAVIS, C. H.: "A Contribution to the Etiological Study of Ovaritis." *Surg., Gynec. and Obst.*, 1916, 560.
- FRANKL: "Pathologische Anatomie u. Histologie der Weiblichen Genitalorgane." *Leipmann's Handbuch des Gesammt, Frauenheilkunde*, vol. i, Vogel, Leipzig, 1914.
- GRIFFITH AND WILLIAMSON, H.: "Diseases of the Ovary." *System of Gynecology*, Albutt, Playfair and Eden, Macmillan & Co., London, 1909.
- HOFMEIER: "The Latest Results of Ovariectomy, Especially in Cases of Doubtful Character of the Disease." *Trans. Am. Gyn. Soc.*, 1909, 333.
- JONES, W. C.: "Etiology, Pathology and Treatment of Ovarian Cysts." *Surg., Gyn. and Obst.*, 1913, xvi, 63.
- KRUCKENBERG, G.: "Über des Gleichzeitige Vorkommen von Carcinom u. Dermoidcyste in ein und Demselben Ovarium." *Arch. f. Gynäk.*, 1887, xxx, 241.
- MACCALLUM, J. B.: "Notes on the Wolffian Body in the Higher Mammals." *Am. Jour. Anat.*, 1901-2, i, 225.
- NORRIS, C. C.: "A Clinical Study of the Complications Arising in 63 Consecutive Cases of Ovarian Tumor with Especial Reference to Malignancy." U. of Pa. Med. Bull., 1906, v, 1.
- NORRIS, R. C.: "Ovarian Neoplasms Complicating Pregnancy and Labor." *Am. Jour. Obst.*, 1913, lxxviii, 420.
- OUTERBRIDGE, G. W.: "Kruckenberg Tumor of Ovary." *Am. Jour. Obst.*, 1911, lxiv, 925; *Ibid.*: "Thyroid Tissue Tumors of Ovary." *Am. Jour. Obst.*, 1913, lxxviii, 1032.
- PFANNENSTIEL: "Die Histogenese der Dermoid und Teratome." *Veit's Handbuch der Gynecolog.*, iii, 382, 1st Edition.
- PICK: "Struma Thyroidea Aberrata Ovarii." *Deutsch. Med. Ztschr.*, 1902, No. 35; *Ibid.*: "Zur Kenntniss der Teratoma Blasenmoleartige Wucherung in einer 'Dermoid' Cysts des Eierstocks." *Berl. klin. Wchnschr.*, 1902, No. 52.
- PORTER, M. F.: "Sarcoma of Ovary." *Jour. Ind. Med. Asso.*, 1915, viii, 119.
- REEL, P. J.: "Diffuse Fibromyomata of Ovary." *Am. Jour. Obst.*, 1917, lxxv, 400.
- RIES, E.: "Struma of Ovary." *Surg., Gynec. and Obst.*, 1914, xviii, 262.
- ROSENOW, E. C., AND DAVIS, C. H.: "The Bacteriology and Experimental Production of Ovaritis." *Jour. Am. Med. Asso.*, 1916, lxvi, 1175.
- SCHLAGENHAUFER: "Ueber des Vorkommen Chorioepithelion und Traubenartiger Wucherung im Teratomen." *Wein, klin. Wchnschr.*, 1902, Nos. 22 and 23.
- STONE, W. S.: "Metastatic Carcinoma of the Ovaries." *Surg., Gynec. and Obst.*, 1916, xxii, 407.
- VINEBERG, H. N.: "Twisted Ovarian Cyst Complicated with Pregnancy, Simulating Symptoms of Renal Calculus." *Am. Jour. Obst.*, 1914, lxx, 68.
- WIENER, S.: "A Study of the Complications of Ovarian Tumors." *Amer. Jour. Obst.*, 1915, lxxii, 209.
- WILDER, R. M.: "Peritonitis Following Acute Ovaritis of Anginal Origin." *Jour. Am. Med. Asso.*, 1916, lxvi, 569.
- WILMS: *Die Mischgeschwülste*. Georgi, Berlin u. Leipzig.

CHAPTER XXI

PELVIC INFLAMMATORY DISEASE

Classification, Etiology, and Pathology.—Pelvic inflammatory disease is a term which may be used to denote lesions of an inflammatory type affecting the pelvic organs. Such lesions may be acute or chronic, and may involve, either singly or collectively, the uterus and adnexa (metritis, salpingitis, ovaritis); the pelvic peritoneum (peritonitis), and the pelvic cellular tissue (cellulitis, lymphangitis, parametritis).

The exciting cause of pelvic inflammatory disease is bacterial infection; in some forms, notably the puerperal, trauma may be a predisposing factor.

It is convenient to classify acute pelvic inflammatory disease from the clinical standpoint as:

First: Pelvic inflammatory disease occurring *in the course of gonorrhæa (gonorrhæal)*.

Second: Pelvic inflammatory disease occurring *after abortion or labor (post-abortion, post-partal)*.

Third: Pelvic inflammatory disease occurring *after instrumentation or operation on the uterovaginal tract (post-operative)*.

Fourth: Pelvic inflammatory disease occurring *in the course of tuberculosis (tuberculous)*.

Fifth: Pelvic inflammatory disease occurring *in the course of general infections (typhoid fever, small-pox, scarlet fever, etc.)*.

A major proportion of pelvic inflammation is caused by the *gonococcus*. If gonorrhæa is not energetically treated and stamped out before it gains a foothold in the cervix it sooner or later reaches the adnexa. Just what proportion of inflammatory cases are due to the *gonococcus* it is difficult to determine, because the pus in old cases of pyosalpinx is very often sterile, and no organisms can be recognized either from smears or from cultures. Nevertheless, all investigations indicate the preponderating influence of the *gonococcus*. Miller examined bacteriologically 43 specimens of pyosalpinx, ovarian abscess, etc., which had been removed by laparotomy. Of these 33 were negative; in seven the *gonococcus* was found; in one there was a mixed infection of the streptococcus and staphylococcus. Krönig in 122 cases of suppurative salpingitis or pyosalpinx found 75 negative; the *gonococcus* was found in 28 cases; the tubercle bacillus in eight; the streptococcus in three; the staphylococcus in one; and in one case the bacillus coli communis.

In *post-abortion* or *post-partal* disease, the streptococcus plays the most important rôle. Williams examined the uterine lochia in a series of 150 cases of his own, in which the temperature rose to 101° F. or higher during the first ten days of the puerperium. He found the streptococcus in 31; the bacillus coli communis in 11; the *gonococcus* in seven; the staphylococcus in four; mixed infection in 14; unidentified aerobic bacteria in four; unidentified anaerobic bacteria in eight; the bacillus of diphtheria in one, and the bacillus of

typhoid fever in one; 25 of the cases exhibited no organisms whatever, while in 45, although bacteria were found on the cover-slips, no growth occurred on any of the more usual culture media. It is evident from this and other studies that although the streptococcus is the organism that most frequently produces post-abortion or post-partal infection, the bacillus coli communis, gonococcus, staphylococcus, and certain saphrophytes play a considerable part.

Pelvic inflammatory disease occurring *after instrumentation or operations* on the uterovaginal tract is very rare. Formerly, when the sounding of the uterus and intrauterine applications were common, infections of this sort were more frequently observed. At the present time the introduction of foreign bodies into the uterus for the purpose of bringing on the menstrual flow (delayed menstruation or early pregnancy) is the most common source of this clinical variety of infection. The organisms involved are the same as those observed in puerperal inflammation, notably the streptococcus, colon bacillus, and staphylococcus. Post-operative pelvic inflammation following curettement or plastic operation on the uterovaginal tract is usually not an indication of a new infection, but rather the result of the outbreak and extension of an old one, especially of a previously existing but unrecognized gonorrhœal salpingitis.

Pelvic inflammatory disease *secondary to tuberculosis* elsewhere will be dealt with in Chapter XXX, page 560.

Pelvic inflammatory disease occurring in the *course of a general infection*, from the deportation of the infecting organism through the blood-stream to the genital tract, has been observed especially in children with small-pox, typhus fever, scarlet fever, typhoid fever, etc. The inflammation, as a rule, is mild in type and unobserved, being masked by other symptoms.

The course of a given case of pelvic inflammatory disease depends: Upon *the nature and virulence of the infection*; upon *the condition of the genital organs*, whether resting, pregnant, or puerperal, and whether or not the seat of injury, tears, bruises, etc., and finally upon the *vital resistance* of the woman. In other words, an infection due to gonorrhœa pursues a course different from that due to the streptococcus, and either of these infections is more serious during pregnancy or the puerperium than at any other time. An accidental streptococcus infection during an operation upon the uterovaginal canal in the non-pregnant state does not give a clinical picture of the same degree of severity as a like infection following abortion, miscarriage, or labor. Gonorrhœa, when it extends to the adnexa during the puerperium, advances with unusual rapidity. During pregnancy and the puerperal state, the genitalia provide a field most favorable to the growth of bacteria and the absorption of their toxic products; and the anatomic changes in the lymphatics and the blood-vessels favor the development of lymphangitis, phlebitis, and septicæmia.

GONORRHŒAL PELVIC INFLAMMATORY DISEASE

Etiology and Pathology.—Gonorrhœal infection usually travels by continuity along the mucous membranes of the genital tract (Fig. 377). The gonococcus, once implanted in the tissues of the cervical canal, is afforded an opportunity to pass into the endometrial cavity by any circumstance

which favors an exacerbation of the gonorrhœal inflammation; dilates the internal os, the natural barrier between the cervix and the endometrium, or by any means which actually carries the infection into the uterus. The gonococcus may gain access to the uterus at the menstrual period, after labor, or during some intrauterine manipulation. After the endometrium has become infected, the disease is very apt to extend to the Fallopian tube, and thence to the pelvic peritoneum. Gonococcus salpingitis is the most frequent disease of the Fallopian tube (see Salpingitis, page 359). When the gonorrhœal pus escapes from the abdominal ostium, it irritates the pelvic peritoneum and sets up a violent inflammatory reaction around the fimbriated extremity. This secondarily involves the ovary, which becomes covered with the inflammatory exudate. One tube is commonly affected before the other, but both tubes, as a rule, ultimately become involved.

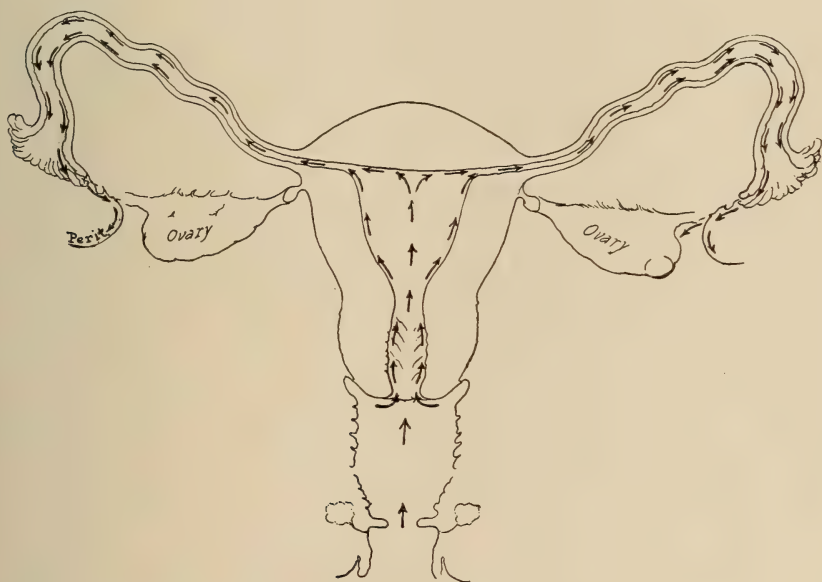


FIG. 377.—Diagram illustrating spread of gonorrhœal infection, in contrast to streptococcus and staphylococcus infection (see Fig. 381).

The inflammation of the peritoneum in a majority of cases remains confined to the pelvis, and under proper treatment shows little tendency to extend upwards into the general peritoneal cavity. This fact depends largely upon the anatomy of the parts and the peculiarities of the gonococcus. The ovaries and the tubes lie in Douglas' pouch, between the broad ligaments and the rectum. The great omentum, small intestine, and the sigmoid flexure dip down into the pelvis and cover the viscera more or less completely. The gonococcus seems to be little disposed to extend rapidly along the peritoneal surfaces. The serous surfaces of any of the structures named, when they are inflamed, have a tendency to adhere to the other surfaces adjacent to them, and in this way the infected areas are quickly isolated and the spread of infection is checked. The lesions usually found in

the initial attack of gonorrhœal pelvic inflammatory disease are suppurative endosalpingitis, perioöphoritis, and pelvic peritonitis. After repeated attacks, or as an ultimate result of the first one, there may be pyosalpinx and ovarian or tubo-ovarian abscess. The pathology of these has been discussed in Chapter XIX, page 359.

Symptoms.—The symptoms of gonorrhœal pelvic inflammatory disease consist of sharp pain in the lower abdomen on one or both sides, associated with an elevation of the temperature, an increase of the pulse-rate, and tenderness and rigidity of the lower abdomen. These symptoms vary greatly, according to the virulence and extent of the infection. In the mild cases there may be very little variation of temperature or pulse, and the local manifestations may be very moderate, whereas in severe forms of infection all these symptoms are of the most extreme degree.

An attack of gonorrhœal pelvic inflammatory disease usually begins during or shortly after the menses; the period often stops suddenly just before the attack begins. The history of a leucorrhœal discharge beginning soon after marriage or of suspicious intercourse may be elicited; there may have been similar attacks before. The bowels are constipated, and abdominal distention, pain, rigidity, and tenderness are quite marked. Nausea and vomiting are commonly present, but the gastric symptoms are less prominent than the others. The temperature varies between 101° and 103° F., and the pulse is increased proportionately to 100 or 120; respiratory action is more frequent. A leucocytosis is invariably present, usually between 10,000 and 15,000; rarely over 20,000. Chills are exceptional. The lower abdomen is tender and rigid, without much difference between the two sides. Evidences of a gonorrhœal infection may usually be found upon inspection of the external genitalia or cervix (see Chapter XXIX, page 556).

Bimanual pelvic examination, if the attack is the first one, will afford little definite information. The patient will complain of considerable tenderness; the lower part of the abdomen will be distended and rigid, so that deep palpation will be impossible; there will be considerable heat in the pelvis; the vaginal fornices will be quite tender, and movement of the uterus will be painful, but in the acute stage, no pelvic masses are likely to be felt.

Diagnosis.—It is very important at this stage to differentiate the attack from appendicitis; both have fever, acceleration of pulse-rate, and pain and tenderness in the lower abdomen, and both are accompanied with leucocytosis. In gonorrhœal pelvic inflammatory disease, however, the history of a Neisserian infection may be obtained, or evidences of it may be discovered. The gastric symptoms are less pronounced, and yield more rapidly to treatment than in appendicitis. The pain does not affect the upper abdomen. The muscle spasm and rigidity are often noted on both sides of the lower abdomen. The greatest tenderness is below the level of McBurney's point and more to the median line. There is less likely to have been preceding indiscretion in diet. The temperature is relatively higher while the leucocytosis is relatively lower than in appendicitis. The symptoms of acute gonorrhœal pelvic inflammatory disease tend to become progressively less if appropriate treatment is instituted. This is not so frequently the case in appendicitis. Gonorrhœal pelvic inflammatory disease must also be distinguished

clinically from puerperal pelvic inflammatory disease. The symptoms of the latter condition are often more general than local; there is much more toxæmia and prostration in puerperal than in gonorrhœal pelvic inflammatory disease. Fortunately, the history and the circumstances of the attack point to its true nature (post-partal, post-abortal, post-operative) (see page 419).

Treatment.—The treatment of **acute** gonorrhœal pelvic inflammatory disease is never surgical. There are certain cases in which the disease may so closely resemble an acute inflammation of the appendix that the surgeon will open the abdomen expecting to find appendicitis, but this is exceptional. If the diagnosis is clear, or, if the medical attendant leans toward the diagnosis of salpingitis, and the patient shows no symptoms which demand an immediate exploratory celiotomy, non-operative measures should be instituted as follows: The patient should be kept quiet in bed, in the Fowler position; nothing should be allowed by mouth; intestinal distention should be relieved with enemias; continuous enteroclysis should be given, and ice-bags should be placed upon the lower abdomen. Laxatives and cathartics are contraindicated. It is rarely necessary to use stimulants or sedatives. The pain is relieved by cold applications to the abdomen. As soon as the acuteness of the attack has subsided, vaginal douches as hot as the patient can bear (100° F.) (see Vaginal Douches), should be started, using a solution of bichloride of mercury (1:10,000); a considerable quantity (one to two gallons) of solution should be used. At the same time, the ice-pack should be replaced with hot compresses or hot flaxseed poultices. Under this plan, usually within three days, sometimes a week, the temperature and the pulse will be reduced to normal, the patient will no longer complain of pain, distention of the abdomen will be relieved, and there will be much less rigidity and tenderness. At this stage examination will show more or less fixation of the uterus, with adnexal masses on one or both sides. Usually it will be difficult to outline these masses on account of tenderness, and because the adnexal tumor is accompanied with pelvic exudate and œdema of the broad ligaments. If the local treatment is continued, the exudate is absorbed gradually, the tenderness disappears, and the characteristic sausage-shaped (pyosalpinx and adherent ovary) adnexal tumor may be distinguished lying to either side of and behind the uterus. For a while energetic palpation of the mass will produce considerable pain, and possibly an exacerbation of the temperature and the pulse, but the longer the patient is kept under the therapeusis mentioned, the less marked will be the reaction.

If it can be avoided, operation should never be undertaken until palpation of the pelvis is comparatively painless, and there is no rise in temperature or pulse-rate following a vigorous examination. Even then it is advisable to continue the palliative treatment, hot douches, etc., until the pelvic masses no longer become smaller but remain stationary in size. The reason for delay in the operative treatment of acute salpingitis is because of the disadvantages of operation during the acute stage. A spread of infection to the peritoneal cavity is much more likely to occur at this time than later; the fresh exudate makes conservative surgery almost impossible, and the

tissues are so friable as to materially increase the technical difficulties of the operation. In the subacute or chronic stage, the danger from a spread of the infection is almost *nil*, for the organisms lose their virility or die; the precise extent of the injury to each individual organ can be determined; diseased portions can be removed and the healthy allowed to remain; the plastic exudate has disappeared; the tissues have lost their friability, and the technical difficulties have been largely overcome.

In some cases diagnosed as gonorrhœal pelvic inflammatory disease, notwithstanding the rest in bed and the palliative measures advised, the temperature will not fall to normal, but maintains a more or less continuous course, and this almost invariably indicates a mixed infection. When this happens the palliative treatment must be continued for a much longer time than usual. If a localization of pus occurs in Douglas' pouch, the abscess may be opened and drained through a posterior vaginal incision. If the pelvic masses are higher, operation should be deferred, as a rule, but when the symptoms continue and the general condition of the patient becomes progressively worse, a plan sometimes crowned with success is to make a posterior vaginal incision and endeavor to break into the abscess sac by a cautious separation of the inflamed surfaces by the examining finger, or, to make an exploratory abdominal incision, and, under the guidance which this affords, drain the infected area through the vagina, or if vaginal drainage is impracticable, through the lower end of the celiotomy incision. It is wise always to avoid operation; if possible, while the septic elevation of temperature and pulse continue, unless the presence and situation of pus is evident and drainage may be quickly and safely instituted.

The treatment of gonorrhœal pelvic inflammatory disease in the **subacute** or **chronic** stage depends upon the degree and extent of the pelvic condition, upon the suffering which the patient has to endure, and upon her social state. In mild cases when the alteration of form is slight and the adnexal enlargement is small; when the uterus is in normal, or nearly normal, position; when the patient is not incapacitated for work or play, and especially if she is in such circumstances that she can afford to take life easy and receive continuous treatment, palliative measures may be continued with the hope of temporary, if not permanent, relief of the troublesome symptoms.

When the adnexal masses are larger; when there is displacement of the uterus; when there are symptoms which evidently result from adhesions between the pelvic and the neighboring structures, when the patient is obliged to earn her living and has little time to devote to hygienic measures, and when the suffering is more or less constant and severe, then nothing but operation will suffice. A good test in doubtful cases is to allow the patient to resume her normal activities after all the acute symptoms have subsided during a more or less prolonged continuance in bed, and then, if she continues to suffer in any way, either at or between her menstrual periods, or both, operation is desirable.

The nature of the radical abdominal operation for chronic gonorrhœal pelvic inflammatory disease depends upon the extent of the lesion and the pathological changes which have occurred in the pelvic organs. When the

operation has been postponed until all the acute symptoms have subsided, the surgeon is able to estimate the extent to which the pelvic organs have been damaged, and therefore is better able to judge what may be conserved and what must be totally removed.

It is a good plan before opening the abdomen to *thoroughly disinfect the external genitalia, burning out or excising infected glands, amputating or cauterizing infected cervical tissue, and thoroughly curetting and cauterizing the endometrial cavity.* All of this is not always feasible if the patient is in poor condition or if it is likely that it would prolong the operative procedure beyond safe limits, but the curettement and cauterization of the cervix and fundus are of the greatest importance. It is only after the abdomen is opened that the surgeon will be able to determine positively the extent of the operation. It may be necessary to do a total extirpation of the uterus and appendages, or the operator may stop with the removal of both tubes, leaving the ovaries, or it may be possible to save but one ovary or one tube. As a rule, if it is



FIG. 378.—Bilateral pyosalpinx. Perioöphoritis. (Gynecological Laboratory, U. of P.)

found requisite to remove both ovaries and both tubes, the uterus itself should be taken out.

When this must be done the first step in the operation consists in releasing the adhesions between the pelvic and the surrounding structures, freeing the uterus and both tubes and ovaries, and inspecting the damage which has been caused to each of them. If a tube contains pus it should be removed without hesitation. If an ovary is covered with dense adhesions, or if it has undergone cystic degeneration so that the entire organ is made up of cystic spaces of varying size, unquestionably its removal is advisable. If the ovarian capsule is not much thickened and the cystic changes in the ovary itself are not pronounced, suspension of the ovary in a new position may be sufficient to effect a cure. If the tubes have been so adherent that, when released from adhesions, they show an almost uniformly raw surface with many bleeding points, removal is usually the best plan, and the same may be said of the ovaries. In some cases the process of releasing the adhesions which have formed between the adnexa and the surrounding parts will so mutilate the ovary or tube as to make

their removal imperative. If the ovary is considerably damaged and the surface bleeds freely, resection may be done if the other ovary is in questionable or bad condition (Fig. 379). When the tube is distended with clear fluid (hydrosalpinx), the outer part of the tube may be excised (Fig. 380), and the mucosa of the tubal canal united with the serous coat by fine sutures, with the hope that the possibility of conception and reproduction will be preserved. The number of instances in which this plan will be feasible are few, and it will almost invariably fail, unless: the occluded tube contains no infectious matter; the part of the tube which is left has a smooth outer surface and an intact lining mucosa, and the tube presents no obstruction to its lumen between the new ostium and the uterine cavity as evidenced by marked distortion, twists, or localized enlargements.

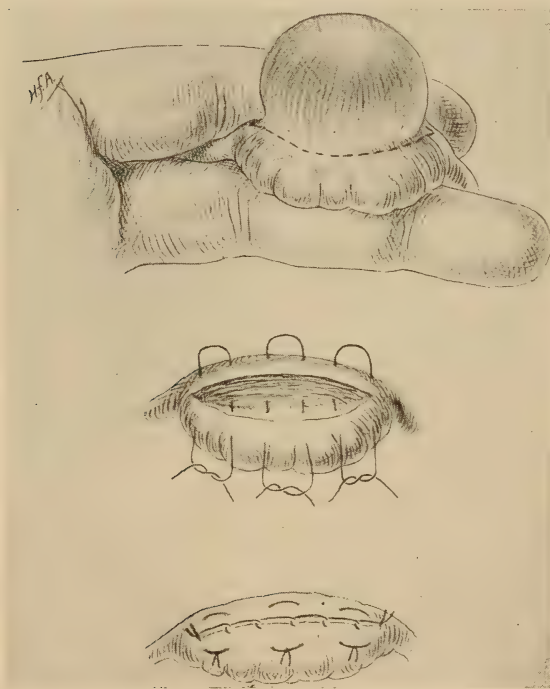


FIG. 379.—Resection of the ovary.

As a rule, it is better either to remove the ovary *in toto*, or to let it remain undisturbed. In exceptional cases, it will be possible to leave a small portion of the hilus of a badly diseased ovary, but the frequent practice of resection of one-third or one-half of the ovary, or the indiscriminate puncture of follicles, or cauterization of infected areas, will result in subsequent trouble in a large proportion of cases. Furthermore, the surgeon must be guided by the condition of the other ovary. If that is entirely healthy, total removal of the affected organ is preferable to resection. It is quite common for the isthmus of the tubes to be enlarged and present nodular masses at the uterine cornua—*salpingitis*

nodosa—but such conditions do not indicate the removal of the uterine fundus, since the diseased tube and the adjacent uterine cornua may be excised by a wedge-shaped incision. If the *preliminary curettement* and *disinfection* of the *endometrium* have been carried out, the excision of diseased cornua will leave the uterus potentially healthy and capable of the menstrual function.

The whole attitude of the surgeon should be to preserve, if possible, the menstrual and the reproductive functions in young women. No surgical risks imperiling life should be taken to preserve the reproductive functions, unless it is the voluntarily expressed wish of the patient. If the patient desires it, the chance may be taken of leaving a badly damaged tube or

ovary in the hope of subsequent pregnancy, but otherwise the surgeon will do well to remove any such organs.

Every effort should be made, however, to preserve the menstrual function, for upon this much of the happiness of the individual depends, and the complete removal of the pelvic organs at an early age is often followed by nervous phenomena which are disastrous and permanent. There are numerous cases, however, in which it is utterly impossible to conserve even a vestige of either tube or ovary, and under such circumstances the surgeon should not hesitate, but proceed to remove both adnexa with the fundus of the uterus (see Ovarian Transplantation, Chapter XXXIII).

PUERPERAL PELVIC INFLAMMATORY DISEASE

Etiology and Pathology.—Pelvic inflammatory

disease of this variety is due to the introduction of infectious material into the genital tract, usually into the uterus, after labor, miscarriage, or abortion. The organisms commonly involved are the streptococcus, the bacillus coli communis, and the staphylococcus; the gonococcus and the saprophytic organisms, also, are occasionally found. In contradistinction to the gonococcus, which travels along the mucous membranes of the genital tract, as a rule, and shows feeble powers of

penetration, the streptococcus enters the uterine wall by inoculation at some point and, by means of the lymphatics or veins, passes directly through the wall of the uterus. Thus when the cervix or the lower uterine segment is infected by the streptococcus (Fig. 381), the infection extends through the uterine wall into the cellular tissue at the base of and between the layers of the broad ligaments (cellulitis). When the infection is deposited at a higher point it may reach the ovary (ovarian abscess) through the lymphatics of the broad and the utero-ovarian ligaments. Ovarian abscess is the most common adnexal lesion in puerperal pelvic inflammatory disease. Again, the infection may pass through all the coats of the uterus and attack the peritoneum (pelvic peritonitis)

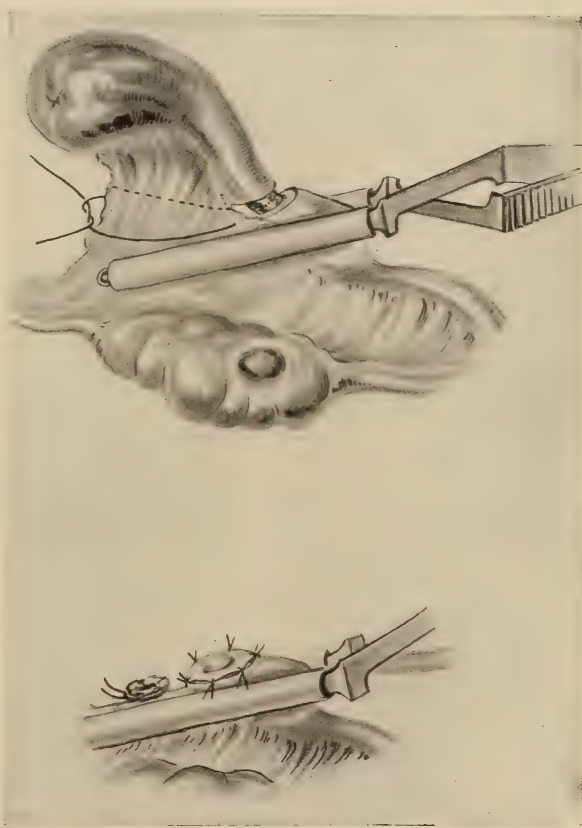


FIG. 380.—Salpingostomy (page 438).

or the adnexa (perisalpingitis-perioöphoritis); or it may infect the thrombi and veins at the placental site (thrombophlebitis). Very often, not one, but several of these avenues are traversed by the infection, so that there may be various combinations of septic lesions. Puerperal pelvic peritonitis due to the streptococcus is much more apt to extend into the abdomen than gonococcus peritonitis. Infections of the mucosa of the tube, endosalpingitis and pyosalpinx are quite unusual in puerperal pelvic inflammatory disease; but a hydrosalpinx may be formed by inflammation of the outer serous coat of the tube with occlusion of the abdominal ostium.

The progress of the infecting organisms may be stopped at any point by the resistance of the tissues. The symptoms resulting from the entrance of the toxins (toxæmia) of the bacteria themselves (bacteriæmia, septicæmia,

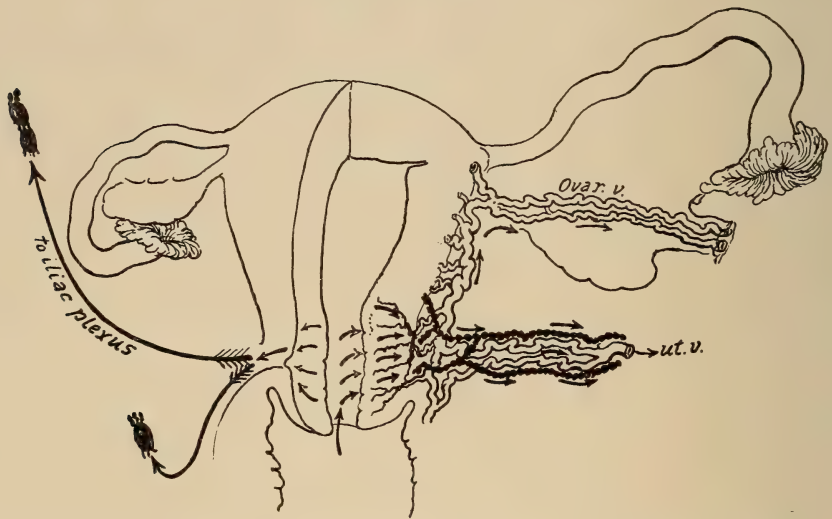


FIG. 381.—Diagram, illustrating streptococcus and staphylococcus infections spreading through the veins and lymphatics. (See Fig. 377.)

pyæmia) into the general circulation are often a prominent feature of puerperal pelvic inflammatory disease. Sometimes the toxins overwhelm the patient and death occurs before there are any demonstrable local evidences of infection. The pelvic lesions which may result from puerperal pelvic inflammatory disease are any one or any group of the following: Acute endometritis; acute metritis; uterine abscess; cellulitis; abscess of the cellular tissue; ovaritis; ovarian abscess; peritonitis, localized, pelvic, or diffuse; lymphangitis of the broad ligaments and pelvic lymphatics; thrombophlebitis of the veins at the placental site, and in the broad ligaments, etc.

Symptoms.—The trouble dates from labor or abortion, or some intra-uterine manipulation or operation during pregnancy. The disease is either ushered in suddenly by a chill and by pyrexia of an alarming degree, sometimes as high as 105° F., or the fever gradually develops during the first days or week of the puerperium. There is a leucocytosis of from 15,000 to

25,000, sometimes as much as 40,000. The pulse-rate is usually more rapid than would correspond to the height of the temperature. Indeed, the first symptom of puerperal infection may be an undue rapidity of the pulse. There may be actual chills associated with hyperpyrexia, or merely chilly sensations without any marked variation in the temperature curve. The patient may complain of pain in the lower abdomen, worse, perhaps, upon one side, though in many cases the pain is very slight. Constipation is the rule, although there may be diarrhoea later in the more septic cases. Headache is often present. The lochial discharge has no odor unless there are retained and putrefying secundines, and except in such cases the amount of the lochial discharge is diminished.

Diagnosis.—Puerperal peritonitis follows labor, abortion, or some intra-uterine manipulation or operation during pregnancy. Careful inquiry as to the course and conduct of the labor or the abortion may indicate the probability of the direct introduction of infectious germs into the utero-vaginal tract. In cases of criminal abortion, the patient may often deliberately attempt to deceive the physician. The general symptoms are much more violent, as a rule, in the puerperal than in the gonorrhœal form of peritonitis. The disease may manifest itself within a few hours or several days of the infection. There is often but little pain. The general symptoms of intoxication, however, such as pyrexia, rapidity of the pulse, etc., are always greater than in the gonorrhœal form.

Examination of the birth canal and the pelvic organs must be made with the utmost care and gentleness. In the earlier stages of puerperal pelvic inflammatory disease examination may show nothing; local evidences of infection may not be present. As the disease progresses, unless the patient is overwhelmed and dies of the toxæmia, the local evidences develop. The external genitalia, perineum, vagina, and cervix should be inspected and carefully palpated for evidences of inflammatory and infectious processes (induration, tenderness, false membrane). The size of the uterus is usually greater than would normally correspond to the day of the puerperium (arrested involution); the cervix may be patulous (arrested involution or retained secundines). The uterus may be fixed with areas of induration on one or both sides (cellulitis, adnexitis, pelvic peritonitis). The uterus may be displaced by a mass on one side or back of it (ovarian abscess). The lower abdomen may be tender and rigid (metritis, adnexitis, peritonitis); the uterus may be very distinctly enlarged and palpable (subinvolution, metritis); the abdomen may be distended; peristalsis may be diminished or absent (peritonitis); there may be an area of tenderness over Poupart's ligament at the femoral sheath, or along the femoral vein; there may be œdema of the corresponding leg (femoral thrombophlebitis).

Prognosis.—The outcome of the attack is always doubtful. A rapid absorption of toxic products from the infected pelvic organs or from a spreading peritonitis may quickly end in death. Except in the most virulent forms of infection and those associated with perforation or rupture of the uterus, or in neglected or badly treated cases, the outlook is more hopeful. The prognosis is of necessity dependent to a considerable degree upon the virulence of the infecting organism and upon the strength of the patient. An

estimation of the white blood corpuscles may be of some value as an indication of the patient's resistance to the infection. A comparatively high leucocytosis is favorable. A low count in the presence of severe general symptoms is bad. The worst cases are those in which the general symptoms are marked and yet the localized evidences are slow in appearing, or do not appear at all. The patient under such circumstances suffers from the presence in the blood of the infectious organism and its products—bacteriæmia. If the toxin alone is present, the prognosis is less serious. Blood cultures should be made, if possible, in every suspected case. If the streptococcus is found, the outlook is dubious; the staphylococcus and the bacillus coli communis are less dangerous, although bacteriæmia of any variety is often fatal. When the infection becomes localized in the pelvis, as is evidenced by the development of pelvic masses (ovarian abscess, pelvic peritonitis), or areas of stony hardness (cellulitis), the prognosis is better. If pus forms in an easily accessible position (ovarian abscess in Douglas' pouch; abscess in the cellular tissue of the broad ligament), vaginal puncture and drainage will usually result in immediate improvement in the general condition, and may be followed by a speedy resolution of all the surrounding inflammatory changes in the pelvic organs.

While in puerperal thrombophlebitis there may be nothing abnormally palpable in the pelvis at any time; as a rule, some time during the course of the inflammation there will develop tenderness in the lower abdomen, broad ligament, inguinal and femoral region of the affected side, with more or less marked œdema of the corresponding lower extremity. There may be repeated chills and alarming elevation of temperature without bacteriæmia. When there are no bacteria in the blood-stream the general condition remains fair in most cases, and while recovery is protracted, it finally occurs.

End-results.—Puerperal pelvic inflammatory disease leaves little residuum in the way of structural changes. Infiltrates and exudates which do not progress to the formation of pus are gradually absorbed. If pus forms and is not evacuated by surgical means it gradually burrows its way until the abscess ruptures into the vagina, rectum, bladder, small intestine, or "points" externally above Poupart's ligament. The pelvic organs may return entirely to the normal, after the subsidence of the inflammation, even though extensive pelvic exudates have been present during the acute attacks. Adhesions between neighboring organs may become entirely absorbed, so that months or years afterwards a pelvic examination does not show the slightest evidence of the previous affection. For this and other reasons which will be shown later, the removal of organs for the cure of puerperal infection is seldom indicated.

Treatment.—Puerperal pelvic inflammatory disease is a wound infection. By the time the clinical evidences make their appearance the tissues have already been invaded by bacteria. Surgery can do nothing at this time, except in a few instances provide external drainage of the infected area; it cannot cope with the infectious germs embedded in the tissues. The resistance of the patient must be the main reliance, and that can be lowered by injudicious or meddling treatment or increased by careful nursing and non-operative measures which help to check the spread of the

disease. If there are indications of trouble in a perineal or a cervical tear which has been repaired, the sutures should be removed at once and the wound freely drained, so that there may be a minimum amount of absorption from the infected surfaces. When the testimony of the medical attendant is clear that the entire foetus and placenta have been removed from the uterus, nothing should be done to disturb the interior of the uterus. Any intrauterine manipulation may do much harm by breaking down the protecting layer of leucocytes, which may have formed beneath the endometrium, and thus opening up new channels of invasion. In some cases the testimony of the attendant is doubtful and it is impossible to say whether or not there is necrotic material within the uterus, in which infectious organisms are swarming and from which toxins are being absorbed. Under such circumstances, if the os is unduly patulous, if the lochial discharge is free and of a putrid odor, if there are no indications of cellulitis or pelvic peritonitis, and if the pulse and temperature elevation are not excessive, the uterus may be gently explored with the finger and portions of placenta within easy reach removed with blunt placental forceps; following this the lower uterine ligament and cervix may be packed with gauze. The gauze pack promotes further dilatation of the cervix, and separation and expulsion of remaining fragments of placenta. The pack is removed at the end of twenty-four hours, when gentle exploration of the uterine interior may be repeated unless one can be quite sure that the remainder of the placental tissue has been expelled. If the uterus is fixed and surrounded by areas of induration in the pelvis, if there is any evidence of peritonitis, if the temperature and pulse are high, and the general condition bad, the uterine interior should be let alone. An exception to this latter statement is found in those cases accompanied with profuse hemorrhage; in them the uterus should be packed with gauze. All of these manipulations must be done with the most rigid aseptic technic. General anæsthesia may be required, but should be avoided if possible. The use of an operating table, support of the legs by stirrups, good light, and plenty of assistance facilitate the manipulations and often render the use of general anæsthesia unnecessary. **Intrauterine douching and curetting are meddlesome and dangerous.** Both have been the cause of immeasurable harm. No intrauterine antiseptics can do any good and curetting only serves to drive an infection deeper into the uterus than it was before. The patient should be placed in the Fowler position to favor a localization of the inflammatory process to the pelvis. Ice-bags should be placed upon the lower abdomen. The bowels should be moved daily with an enema, simple or compound, but no cathartics should be administered. Eight ounces of normal salt solution or two per cent. soda bicarbonate solution should be infused slowly into the rectum every three hours. Nothing but liquids in small quantities should be permitted by the mouth. Ergotin (Bonjean) in dose of two or three grains every three hours may be prescribed with advantage, as it induces firm contraction of the uterus, favors the expulsion of placental fragments, and hinders absorption by diminishing the caliber of the veins and lymphatics in the uterine wall. After a few days, when the danger of a spreading peritonitis has passed, the amount of nourishment given may be increased, and a concentrated and nutritious diet

given. Milk, broths, koumyss, eggs beaten up with milk or broths, pre-digested beef, or any of the highly concentrated, nourishing forms of food should be given up to the point of toleration. The exhibition of drugs by the mouth should be limited, so that the stomach can be kept in good condition for the digestion of food. Stimulants should be withheld until needed and then given in small dose, and gradually increased if more is required. Strychnia sulphate and alcohol in some form (whiskey, brandy, and champagne) are the most useful. Digitalis, caffeine, and camphor may be held in reserve. The temperature, if excessive, can be controlled by the use of the cold sponge. If the patient complains of headache, an ice-cap should be applied.

Many different antiseptic solutions have been recommended and used in the intravenous treatment of puerperal bacteriæmia, but none have survived the test of clinical experience. Of late, intravenous injections of arseno-benzol have been tried by Miller and Chalfant¹ in eleven cases.

The use of sera—anti-streptococcus, anti-staphylococcus, and anti-colon bacillus—is still on trial; on the whole, the results have been disappointing. Nevertheless, in all cases a blood culture should be taken and, if the streptococcus, colon bacillus, or staphylococcus is recovered, the corresponding serum or combination of sera should be injected.

It appears from the observations of Hare, Davis, and others that the benefit sometimes derived from the use of these sera comes more from the foreign protein substance which they contain than from any specific anti-toxic effect. Horse serum is said to do as much good as a serum prepared from the specific organism.

Vaccines have been used to hasten the resolution and absorption of pelvic exudates in the subacute stage of puerperal infection. An autogenous

¹ There were seven recoveries and four deaths. In seven cases the blood showed the presence of various strains of streptococcus. Two of these cases died. In two cases there was a Gram-negative bacillus with two recoveries. Two cases are included in the series who had a negative culture, but they were included as they were clinically blood-stream infections, and both proved fatal. Ten of the infections followed delivery at term and one self-induced abortion at three months. As a result of their observations, they concluded as follows: (1) "With the use of intravenous injections of arseno-benzol we have been able in every instance to rid the blood-stream of its invading organism; (2) all varieties of organisms we have so far encountered seem to be equally influenced; (3) cultures from localized abscesses are usually identical with cultures from the blood-stream. Cultures from the uterus, although this same organism is predominant, are rarely pure cultures; (4) reinfections from focal infections may and do occur, but are not so readily influenced by the arseno-benzol as the original infections; (5) the leucocyte count is usually low in comparison with the temperature and pulse. After arseno-benzol has been given there is a marked increase in the count. If after this time there is a decided decrease in the leucocyte count without a corresponding improvement in the patient, it is probable that the patient has reinfected herself and arseno-benzol may be given without waiting for confirmation of this by laboratory report; (6) in the cases we have had the blood-stream is usually found to be sterile in twenty-four hours, always in forty-eight hours; (7) rabbit experiments made by Dr. C. S. Allison, of the Singer Memorial Laboratory, would indicate that a dose of 6 decigrams is necessary to secure prompt results; (8) in suspected blood-stream infections arseno-benzol may be given immediately after a culture has been taken in order to avoid the delay incident upon waiting for a laboratory report."

In the discussion of this paper, Hare denied that the arseno-benzol could have any antiseptic destructive action upon germs in the blood-stream. He said that Ehrlich had admitted that "neosalvarsan and salvarsan had no specific direct effect upon the spirochæta

vaccine may be prepared from intra-uterine culture or stock vaccines of mixed streptococcus, staphylococcus, and colon bacillus may be used (see Chapter XLI).

These questions at the present time are still in abeyance. In animal experimentation the results with bacterial vaccine and serum treatment are so remarkable that there is little doubt that some day this will be the solution of the problem, but at the present time we know so little about it that no definite rules of practice can be formulated.

Operation in puerperal pelvic inflammatory disease should be limited to the uterine exploration already described during the acute stage and to the evacuation of collections of pus which become manifest at a later date. When in the course of puerperal pelvic inflammatory disease a mass forms on one side of or behind the uterus which softens or "points" in Douglas' pouch, and the daily marked remissions of temperature and the leucocyte count indicate an abscess, posterior vaginal incision and drainage should be made. Likewise collections of pus in the cellular tissue of the broad ligaments which "point" upon the surface of the lower abdomen above Poupart's ligament should be evacuated. Otherwise the pelvis should be let alone; after the temperature has returned to normal or nearly so and the disease is plainly under control, when the uterus is still enlarged (subinvolution), or there are masses on either side or back of it (cellular, adnexal, or peritoneal exudates), resolution may be hastened by hot douches. Operation to correct permanent residua of inflammation, subinvolution, retroposition, adherent or enlarged adnexa is not often required; if so, it should be postponed as long as practicable, weeks or months, after all of the acute symptoms have subsided.

INSTRUMENTAL OR POST-OPERATIVE PELVIC INFLAMMATORY DISEASE

Etiology and Pathology.—Pelvic inflammatory disease may follow intra-uterine manipulation and operation on the uterovaginal canal. It results from the direct introduction of infectious organisms or from the spread of an infection already present. Infection may be directly introduced in the course of a plastic operation upon the vagina or the cervix, or during curet-

of syphilis." He pointed out that if you "put neosalvarsan in a test-tube with spirochæta, the spirochæta is not destroyed by the salvarsan. If, however, you add to the test-tube blood serum, which acts as a complemental body, the spirochæta is at once destroyed by the salvarsan"; that is, he showed that there was no germicidal action by the salvarsan "*per se*", but complementary or other bodies are produced which in turn destroy the parasite. If we accept this drug as having a specific influence upon bacteria which belong to another class than the protozoa or the parasites of syphilis, or of sleeping-sickness, we have to believe that Ehrlich thought he had found a remedy for only one thing when he really discovered a remedy for many things. There is no evidence to date to indicate in any way whatever in experimental pharmacology that salvarsan or neosalvarsan destroys bacteria belonging to the vegetable kingdom in contradistinction to the spirochæta which belongs to the animal kingdom.

"The whole question of the specificity of salvarsan in respect to syphilis has particular relationship to the problem placed before us. It seems that an interesting series of experiments might well be made by taking the microorganisms derived by culture from the affected blood and putting them in test-tubes with salvarsan or neosalvarsan in the presence of, and without the presence of, blood-serum and determining whether under such circumstances salvarsan and neosalvarsan would have any germicidal effect upon these vegetable parasites in the same way that it has an effect upon the spirochæta."

tage. Such an accident, however, is very rare in the hands of an operator who employs care in his technic. The use of soiled instruments in the course of an examination, or the passage of a sound into the uterus, without the thorough scrubbing and disinfection of the vagina and the cervix which should always precede it, has been a fertile source of infection in the past. At the present day no competent and intelligent physician would be guilty of such an error. Attempts to produce abortion by the unskilled or

the uncleanly are very often followed by septic infection and sometimes by perforation of the uterine wall. There are some instances, also, in which infection has occurred from the introduction of a foreign body into the uterus with the purpose of producing abortion when pregnancy did not exist. Infections of this sort are produced by the streptococcus, staphylococcus, and colon bacillus. Pelvic inflammatory disease following an aseptic operation is usually the result of the extension of an inflammation which previously existed, but was not recognized at the time of the operation. Such infection is usually of a gonococcus type, and may have been localized in the endometrium, in the tubes, or in the ovaries. While it is sometimes very difficult to detect an inflammatory process of this sort, the possibility of its existence should always be kept in mind, and

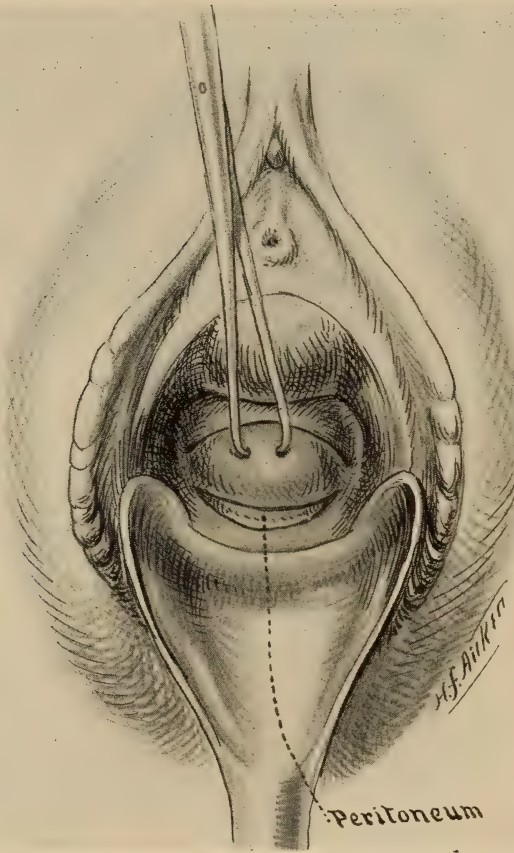


FIG. 382.—Vaginal incision and drainage. First step. The posterior lip of the cervix is held forward. A transverse incision is made through the posterior vaginal wall exposing the peritoneum which is pushed out of the way.

every curettement or plastic operation on the uterus should be preceded by a careful pelvic examination. In case pelvic inflammatory lesions are recognized, the manipulations must be practised with as little disturbance as possible; and in the majority of cases it will be advisable to open the abdomen directly afterwards and correct the diseased condition.

Symptoms.—The symptoms depend upon the nature of the infection. If it is gonorrhœal and has resulted from an extension of the disease to the tubes or to the pelvic peritoneum, the symptoms will be those of gonorrhœal

salpingitis or peritonitis. If the trouble results from the introduction of septic organisms during an operation, or during the passage of soiled instruments or of foreign bodies into the uterus, the symptoms will develop soon after the operation or instrumentation, and will resemble those of puerperal infection (see also Perforation of the Uterus, page 287).

Treatment.—If there is good reason to believe that the symptoms depend



FIG. 383.—Vaginal incision and drainage. The abscess is located by bimanual palpation and the end of a sharp-pointed curved scissors is guided upon the examining finger to the most dependent point of softening and fluctuation. The scissors are then thrust in and the pus evacuated. Separation of the points of the scissors as they are withdrawn enlarges the drainage opening.

upon the extension of a gonorrhœal infection to the pelvic peritoneum, the palliative and conservative measures described under the treatment of gonorrhœal pelvic inflammatory disease are advisable. When the symptoms appear to have followed the introduction of microorganisms during a plastic operation, the operative field should be exposed, the sutures removed if there is any evidence of infection, and drainage provided. Aside from the provision of drainage for the operative field, an expectant policy should be

adopted. The patient should be kept in the Fowler position in bed; the bowels should be opened daily; a light nutritious diet should be given, and stimulants should be prescribed if necessary. Infection following attempts by the unskilled or the uncleanly to produce abortion is most dangerous. If, at the same time, the uterus is perforated the outlook is bad. The symptoms, prognosis, and treatment are the same as in puerperal infection.

Pelvic Abscess.—A pelvic abscess, as the term is generally employed, signifies a collection of pus somewhere within the true pelvis, presenting a well-defined outline recognizable upon physical examination and giving rise to characteristic symptoms (intermittent fever, leucocytosis, etc.). A pelvic abscess may be a periappendicular collection of pus; a large pyosalpinx; an ovarian abscess; an intraperitoneal collection of pus surrounding a primarily infected ovary or tube, or a collection of pus in the cellular tissue of the broad ligaments. The most frequent cause of pelvic abscess is post-abortion, post-partal, and post-operative infection. The most frequent location is the ovary.

The symptoms of pelvic abscess are those of acute pelvic inflammatory disease in which, notwithstanding the lapse of time and appropriate treatment (pages 416 and 420), the fever remains high and becomes remittent, leucocytosis increases, and a well-defined fluctuant mass forms in the pelvis.

Treatment.—If the abscess occupies the pouch of Douglas and produces bulging of the posterior vaginal fornix, it should be evacuated by a posterior vaginal incision (Figs. 382 and 383). If the abscess is the result of a suppurative cellulitis and is extraperitoneal—within the layers of the broad ligament (see differential diagnosis, cellulitis and adnexal disease), operation should be delayed until the abscess points upon the lower surface of the abdominal wall above Poupart's ligament. If this does not tend to occur and there is no indication of a regression of the inflammatory trouble, the pus may be evacuated by means of posterior vaginal incision. Pelvic abscess high up which in spite of prolonged treatment does not point in an accessible location is unusual. When it occurs, a median abdominal incision may be made in order to accurately locate the exact situation of the trouble, and then through an extraperitoneal incision in the lower abdominal region, parallel to Poupart's ligament, the abscess cavity may be drained without contamination of the peritoneum.

CHRONIC PELVIC INFLAMMATORY DISEASE

Etiology and Pathology.—Chronic pelvic inflammatory disease is a term used to designate the residuum of a previous acute pelvic inflammation. Such a residuum occurs much more frequently after gonorrhœal than after the post-abortion, puerperal, or instrumental forms of inflammatory disease. Gonorrhœal pelvic inflammatory disease in the chronic stage exhibits such pelvic lesions as endosalpingitis, pyosalpinx, or hydrosalpinx, perioöphoritis, tubo-ovarian abscess or tubo-ovarian cyst, cystic degeneration of the ovary, simple retention cyst (corpus luteum or Graafian follicle cyst), and peritoneal adhesions.

Puerperal or post-abortion inflammatory disease is less likely to leave a

permanent defect in the pelvic organs. In favorable cases the infecting organisms are overwhelmed by the resistance of the patient; the structural changes are few and rapidly subside. In the severer forms there may be certain residua, which result from an actual destruction of tissue during the acute process. Puerperal pelvic inflammatory disease in the chronic form may exhibit such lesions as subinvolution of the uterus, chronic metritis, atrophy of the uterus, perisalpingitis, hydrosalpinx, chronic oöphoritis, ovarian abscess (sterile disintegrated pus), cystic ovary (cystic generation of a Graafian follicle or corpus luteum), and sclerotic ovary. For a more detailed description of the morbid anatomy of chronic pelvic inflammatory disease, see Chapters XIX and XX.

Symptoms.—The symptoms of chronic pelvic peritonitis arise from mechanical interference with the function of the pelvic organs produced by structural lesions and by recurrences of inflammation in the pelvic organs, arising from either new or latent infection. Dysmenorrhœa is a frequent symptom; the pain begins before the flow appears and lasts until near the end of the period. There is congestion of the ovary and interference with rupture of distended follicles. The periods may be irregular, with a tendency to increased frequency and menorrhagia. Subinvolution—chronic metritis—may be present. When most of the follicle-bearing area of both ovaries has been destroyed, or in the rare cases of uterine atrophy, the intermenstrual time may be lengthened and the flow scant. Leucorrhœa is a very common symptom; the discharge may come from the cervix (chronic gonorrhœa—thick muco-pus) or from the endometrium (glandular hypertrophy—thin mucus).

There is pain in the lower abdomen on one or both sides—worse at the menses, increased by exertion and constipation, and not relieved by the recumbent position. Vesical irritability is a common complaint—either frequency of urination or pain during or after the act. The bowels are usually constipated, and the patient complains of gaseous distention of the bowels, flatulence, etc. Pain during defecation, and dyspareunia are not uncommon symptoms, especially if the ovary is diseased and lies in Douglas' pouch in close proximity to the rectum or the vaginal fornix. Added to these chronic complaints, from time to time, especially in the gonorrhœal pelvic inflammatory cases, there may be an acute exacerbation of symptoms. This results: from trauma, which releases some of the encapsulated bacteria or their toxins; from the accumulation of fæces or gas above a point of constriction in the intestinal coils adherent to the pelvic structures, or to a new or fresh infection of the pelvic organs. Sterility is common in chronic pelvic inflammatory disease.

Diagnosis.—The diagnosis of chronic pelvic inflammatory disease is made from the history of previous acute attacks, the symptoms, and the findings upon bimanual pelvic examination. The uterus is more or less fixed in a normal, retroverted, lateral, or descended position; it may be slightly increased in size. The adnexa are enlarged, tender, and restricted in mobility. The elongated retort shape of a pyosalpinx or hydrosalpinx may often be distinguished from the spherical or elliptical shape of an affected ovary. When the lesion consists principally of adhesions and there

is but slight enlargement of the tube or ovary there may be little recognizable abnormality in the adnexa by palpation, except a feeling of restricted mobility. A thin-walled, flaccid hydrosalpinx may escape observation entirely.

Treatment.—The treatment of chronic pelvic inflammatory disease may be non-operative or operative. The former plan may be adopted when the lesion is moderate in degree and the suffering of the patient not excessive; this plan relieves the patient's sufferings, or at least renders them endurable. The measures which have been found serviceable are those which prevent pelvic congestion, favor the absorption of inflammatory products, and reduce traumatism to a minimum. The bowels should be kept freely open so as to prevent accumulation of feces or gas; hot saline douches (1 to 2 gallons) should be taken, according to the requirements of the case, from several times a day to that often in a week. Hot sitz baths, the electric hip bath, and the general cabinet bath may be useful. Sexual intercourse must be restricted; graduated exercise, walking, etc., without violent exertion, is beneficial. If these things do not relieve the patient sufficiently, or if the woman has been made sterile by the disease, operation may be undertaken. Adhesions may be released, diseased organs removed or partially resected, and the uterus may be placed in good position. (For a detailed discussion of the treatment of the tube or ovary see page 417.)

CELLULITIS

Etiology and Pathology.—Cellulitis is usually the result of post-partal or post-abortion infection. It may be produced by intrauterine instrumentation or operation, and may also result from infected wounds following vaginal or perineal operations.

When the disease is associated with labor or abortion, very often there are lacerations of the cervix which extend more or less deeply into the cervical tissues, or entirely through them, and into the parametrium. The infectious organism gains access to the cellular tissue by way of the lymphatics or the veins. Primarily, the disease is either a lymphangitis or a thrombophlebitis; secondarily, all the constituents of the cellular tissue are involved in the inflammation.

Early in the disease there is an infiltration of the parts with small round cells and polymorphonuclear leucocytes. This inflammatory infiltrate gives a stony hardness to the tissues and fixes the pelvic organs. The induration usually extends from the uterus to the pelvic walls and fuses with the fascia and the muscles overlying the bony pelvis. It is often unilateral, affecting the broad ligament on one side only, though it may be found on both sides. When unilateral it may involve the uterosacral ligament on the affected side posteriorly (the *paraproctium*), and the uterovesical ligament on the same side anteriorly (the *paracystium*). The paracolpium especially is invaded when the trouble starts from an infected wound of the vagina or the perineum. The areas involved in the process depend upon the course of the lymph vessels or veins draining the infected wound. Cellulitis may be combined with peritonitis. When this happens the two conditions may be coincident, though more commonly the peritonitis is

secondary to the cellulitis, and results from a direct extension of the inflammation from the cellular tissue to the pelvic peritoneum.

The inflammatory process either undergoes resolution with absorption of the exudate or it softens and forms an abscess. The pus, as a rule, burrows along the wall of the vagina, causing the vaginal fornix to bulge, and if not released by incision, it bursts into the vagina or into the rectum. The pus may also be discharged into the bladder, or rarely into an adherent loop of intestine. Or, the abscess being extraperitoneal, the pus may lift up the peritoneum, reflected from the anterior surface of the broad ligament to the anterior abdominal wall, and make its appearance in the groin above Poupart's ligament. Rarely it may pass behind the posterior layer of the pelvic peritoneum to the mesosigmoid and present itself externally in the loin. Cases are on record where the pus has burrowed through the pelvic fascia from the paracolpium and the paraproctium to the ischiorectal fossa. When such collections of pus are discharged spontaneously, the abscess cavity rapidly closes and the patient usually makes a prompt recovery.

Symptoms.—The subjective symptoms of cellulitis are similar to those of acute pelvic inflammatory disease following abortion, labor, or septic instrumentation. If suppuration occurs, the temperature assumes a hectic type unless prompt incision is practised. When the paraproctium is involved, rectal irritability may be a prominent feature; when the paracystium is involved, there is usually frequent and painful urination.

The objective signs are somewhat different from those of pelvic peritonitis with salpingitis and ovaritis, unless accompanying the latter there is a considerable amount of plastic exudate; the differential diagnosis then may be nearly or quite impossible. As a rule, upon bimanual palpation, the vault of the vagina, on one or both sides, or entirely around the cervix, is densely hard. The mucosa feels as if it closely overlaid tissues carved out of wood. The cervix is fixed as if frozen into an area of dense induration, which extends without interruption to the bony pelvic wall. If both broad ligaments are involved the uterus may be absolutely immobile.

Examination per rectum will show the same dense hardness of the pelvic mass. If the exudate involves the paraproctium at the point where the uterosacral ligaments surround the rectum, the lumen of the bowel will be narrowed, and to the palpating finger at this point it will feel like an auger-hole in a board, covered with the rectal mucosa. If suppuration occurs, the parts lose their stony hardness, and fluctuation becomes manifest within several days. When the abscess is small and does not bulge into the vagina, it may be difficult to detect fluctuation. In such cases the tissues of the vaginal vault may feel œdematous and there may be slight pitting upon pressure. Quite frequently the abscess points at one side of the vaginal vault.

Diagnosis.—The mass in pelvic cellulitis, as contrasted with that in pelvic peritonitis with salpingitis and ovaritis, is more apt to extend continuously from the cervix to the pelvic wall and to be *firmly fixed to the bony pelvis*. In peritonitis the mass can often be recognized, occupying a position posterior to the broad ligament. When there is much exudate associated with pelvic peritonitis, the differential diagnosis is more difficult or

impossible. In such cases the pelvic mass is apt to fill up Douglas' pouch and press the anterior rectal wall backward, instead of surrounding it as it does in cellulitis.

Treatment.—The general treatment of septic or of puerperal cellulitis differs but little from that of puerperal pelvic inflammatory disease. Under the influence of rest in the Fowler position, liquid diet, daily enemas, cold to the hypogastrium and later heat to the abdomen, and hot vaginal douches, a considerable percentage of cases of pelvic cellulitis undergo resolution and spontaneous recovery.

At times exudates filling half the pelvis disappear. When pus forms it should be evacuated promptly as soon as an area of pointing or softening can be detected; an incision sometimes hastens absorption in the case of large exudates even though suppuration has not occurred. Whenever possible, the broad ligament should be opened from the vagina, the folds of the broad ligament being separated with the fingers, when necessary, in order to reach deep-seated abscesses. At times the incision must be made in the inguinal or the lumbar region.

Chronic Pelvic Cellulitis.—Chronic cellulitis occasionally occurs as the sequel of an acute attack. In some of these cases there is an actual chronic inflammation of the cellular tissue and by a painstaking microscopic examination areas which show inflammatory infiltration may be found. In other cases the inflammatory process has ceased, but a residuum of hyperplastic or cicatricial tissue is left in the cellular tissues. It is often impossible to distinguish clinically between these two forms. According to Ill, cellulitis may also be chronic from the beginning. Thus ulceration of the bladder and dysenteric and follicular ulceration of the rectum may produce a localized low-grade inflammation of the neighboring cellular tissue which finally results in a contracting cicatrix and atrophy of the cellular tissue. It should be remembered that normally the pelvic connective tissue varies in different individuals, and that the rectum and the uterosacral folds in many women are sensitive to pressure through the vaginal vault. The conclusion, therefore, that an actual lesion of the cellular tissue is present because the uterosacral ligaments feel thicker than normal or are tender on pressure, is not justifiable.

Symptoms.—The patient complains of the usual train of gynecologic symptoms—backache, dysmenorrhœa, leucorrhœa, etc., depending in the individual case upon the part of the cellular tissue affected and the amount of dislocation of the pelvic organs which has been produced.

Diagnosis.—Scars in the vaginal vault extending from the cervix may be readily felt upon palpation. Contraction of the cellular tissue elsewhere is harder to distinguish positively from intraperitoneal adhesions. Needless to say, a positive diagnosis is sometimes impossible.

Treatment.—The purpose of treatment is to absorb the cellular exudate and to stretch cicatricial bands. To secure absorption a daily vaginal douche of hot normal saline solution should be ordered, followed by rest in the recumbent posture for at least an hour, saline laxatives, and the use of tampons. The tampons soaked in glycerite of boroglycerine should be introduced three times a week. In order to stretch cicatricial bands, the

vagina should be systematically tamponed with the patient in the knee-chest position, which most favors the restoration of the uterus to its normal position. With these tampons considerable pressure may be made without danger. The smaller sizes should be used and the vaginal canal packed as firmly as is consistent with comfort.

Pelvic massage, if it is ever useful, is indicated in chronic uncomplicated cellulitis. It may be employed by the physician each time before he makes an application of tampons.

PELVIC HÆMATOMA

Etiology and Pathology.—Collections of blood confined to the cellular tissue of the pelvis are spoken of as hæmatoma. They are of extreme rarity. Hæmatoma may be caused by the rupture of varicose veins in the broad ligament; by hemorrhage from the cervical branches of the uterus after extensive operation on the cervix, or by the rupture of a tubal pregnancy between the layers of the broad ligament. This is the rarest of all modes of termination of a tubal pregnancy.

Symptoms.—The symptoms come on suddenly and consist of intense pain, and, if the bleeding is marked, the symptoms of internal hemorrhage will be present.

Diagnosis.—A diagnosis will rarely be made, as the condition is so infrequent. In the presence of pelvic hæmatoma examination shows a mass in the broad ligament intimately associated with and to one side of the uterus, not behind it. There are no signs of peritonitis.

Prognosis.—A hæmatoma usually undergoes absorption. It may burst into the vagina, rectum, bladder, or the free peritoneal cavity. It may become infected and suppurate. Absorption of the blood is slow, but there is less tendency to bad after-results than in the case of hæmatocele, because the peritoneum has not been involved and there are no intra-peritoneal adhesions.

Treatment.—The patient should be kept quiet in bed. An ice-cap should be placed over the lower abdomen. After the hæmatoma is fully developed, hot douches and local and general depletory measures should be adopted. In those cases in which improvement does not follow, palliative measures should be discarded and the hæmatoma should be opened and drained by means of a vaginal incision (Figs. 382 and 383).

OPERATIVE TECHNIC

Hysterectomy for Pelvic Inflammatory Disease.—After the usual preliminary preparations, an incision is made in the median line, the patient being in the horizontal position. If there is any fluid in the pelvis, it should be carefully sponged away. The patient is placed in the Trendelenburg posture, and the intestines packed off as extensively as possible from the pelvis. The diseased ovaries and tubes should be gently freed from the structures to which they are adherent. This may be done entirely by the sense of touch, but it is preferable to keep the operative area in constant view, so as to avoid injury of the rectum, the small intestine, or the bladder. The finger should seek first for a spot of cleavage and the enucleation should

begin on that side where it appears to be most feasible. No force should be employed in separating the adhesions, the palmar surface of the finger being always directed anteriorly toward the broad ligament rather than posteriorly, as, with this precaution, injury to the sigmoid or the rectum is less likely. An occasional snip with the scissors or nick with a sharp scalpel will be advisable when the adhesions are difficult to separate. After the adnexa and the posterior surface of the uterus are free, the fundus is caught with forceps, pulled up into the incision, and then hysterectomy proceeded with in the usual way, as has been described in Chapter XVII, page 317, the successive steps of the operation being: (1) Ligation of the ovarian and the round ligament vessels on each side; (2) clamping the uterine extremity of the tube, round ligament, and utero-ovarian ligament on each side to control the reflux circulation; (3) dividing the broad ligaments down to the supravaginal cervix; (4) incising the vesical reflexion of the peritoneum; (5) ligating the uterine artery on each side; (6) amputating the body of the uterus by means of a wedge-shaped incision through the cervix; (7) closure of the cervical stump with catgut; (8) suspension of the cervix to the round ligaments; (9) peritonealization, making use of the vesical reflexion of the peritoneum.

Variations from the usual technic will be required according to the exigencies of the case. When there are adhesions between the pelvic structures and the omentum, they must be freed before the abdomen is walled off; this is done either by separating the adherent surfaces, or by dividing the omentum between two ligatures. Lightly adherent coils of small or large intestine must be released. The pelvis is now cleared of fluid and the patient having been placed in the Trendelenburg position, the omentum with the free coils of intestine may then be displaced upward above the brim of the pelvis, and the gauze pack introduced. If there is any portion of the intestine so adherent that one fears its liberation may release a collection of pus, no attempts should be made to free the gut until the walling off has been completed. After such intestinal coils have been released, usually they may be covered with hot, moist packs and kept in Douglas' pouch without increasing the technical difficulties of the operation. If it appears very desirable to get them out of the operative area and no pus has been set free, the pelvis and the intestine should be carefully cleansed with hot, moist sponges, the original walling-off gauze should be removed, the intestines lifted above the pelvic brim, and a fresh gauze pack introduced.

In cases of tubal or ovarian abscess, it may be at once apparent upon inspecting the pelvic organs that the adhesions are so widespread or the amount of exudate is so great that any attempt at a radical removal of the diseased organs will expose the patient to unwarranted danger. Under such circumstances the intraperitoneal collection of pus should be drained from below through a posterior vaginal incision (Figs. 382 and 383). In difficult cases the hand inside the abdomen may be used as a guide in reaching the abscess. If evacuation from below is not feasible on account of the intervention of intestine between the posterior vaginal fornix and the diseased area, an extraperitoneal incision through the abdominal parietes may be possible, the hand in the abdomen again being a guide, or if there is no extra-

peritoneal method practicable, the abscess may be drained through the lower end of the celiotomy incision, the area being well walled off with rubberdam and gauze.

If the adnexal adhesions of one side are especially dense, or the adnexal mass is so low in the pouch of Douglas that there is danger of wounding the

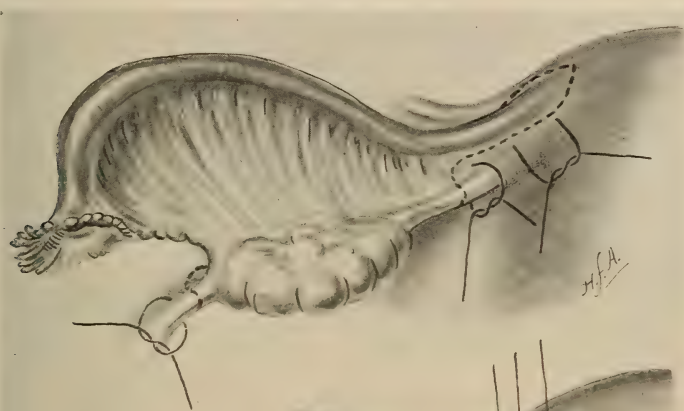


FIG. 384

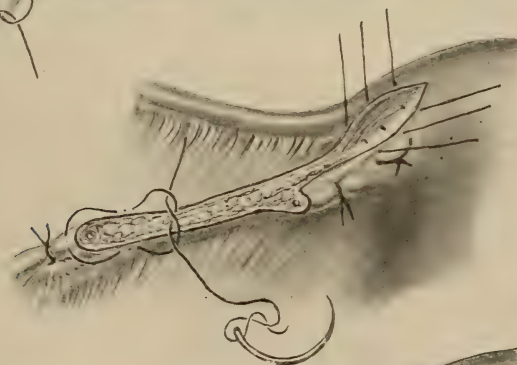


FIG. 385

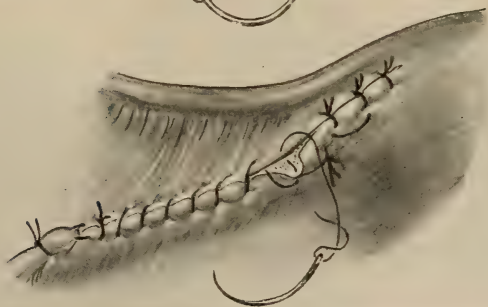


FIG. 386

- FIG. 384.—Salpingo-oophorectomy. Points of ligation and line of excision.
 FIG. 385.—Salpingo-oophorectomy. Suture of cornua and beginning peritonealization.
 FIG. 386.—Salpingo-oophorectomy. Suture of cornua and completion of peritonealization.

intestine or the large pelvic veins by forcible or persistent attempts to release them from above, the hysterectomy may be started on the least affected side, and after the cervix has been cut through and disinfected, the difficult side may be approached from below upward. This will often prove the solution of an otherwise perplexing and dangerous situation.

There are some cases in which the uterus is so densely bound down by adhesions, and both adnexa are so intimately incorporated with the surrounding structures, that a more favorable method of approaching enucleation is by first bisecting the uterus in the median line from the fundus to the supravaginal cervix, then cutting through the cervix on one side to the uterine artery and ligating it, next enucleating the half uterus and the adnexa

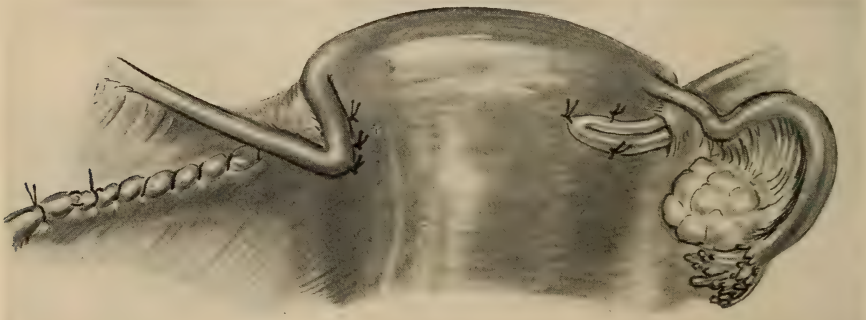


FIG. 387.—Salpingo-oophorectomy. Posterior fixation of round ligament on left and Webster-Baldy suspension on right.

of that side, the enucleation being carried out from below upward, and the vessels tied in that sequence, and then carrying out the same procedure on the opposite side. No drainage is required unless the case is recent.

Salpingo-oophorectomy.—After the preliminary preparations have been carried out, a median abdominal incision is made and the affected area isolated by means of gauze pads. A ligature is then passed through the clear

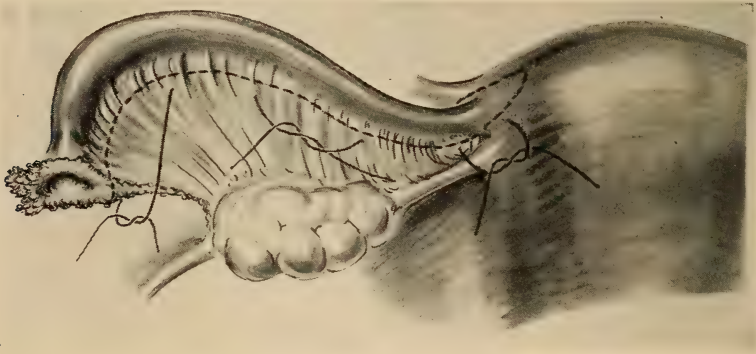


FIG. 388.—Salpingectomy. Points of ligation and lines of excision.

space in the infundibulo-pelvic ligament and tied, thus controlling the ovarian circulation. A second ligature is then placed about the utero-ovarian ligament close to the uterus and a third about the utero-ovarian anastomosis at the uterine cornu just beneath the inner extremity of the tube (Fig. 384). The circulation of the ovary and tube being then secured, the infundibulo-pelvic and the utero-ovarian ligaments should be cut, the ovary

and tube pulled up, and the broad ligament divided close to the adnexa as far as the uterine insertion of the tube. At this point the tube is removed from the uterine cornu by a wedge-shaped incision. The V-shaped opening of the uterine cornu is closed with a series of interrupted sutures, and any bleeding points along the cut surface of the broad ligament are caught with forceps and ligated individually (Fig. 385). A running suture is then carried from the infundibulo-pelvic ligament stump to the uterine cornu,

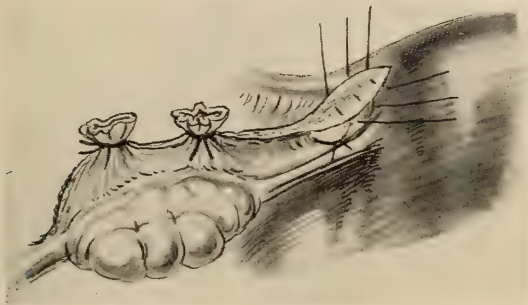


FIG. 389.—Salpingectomy. Suture of cornua.

approximating the cut edges of the anterior and posterior surfaces of the broad ligament and covering all raw areas (Fig. 386).

Salpingectomy.—After the usual preliminary preparations, median incision, and isolation of the operative area, the tube is released from adhesions and held up so that the vessels in the mesosalpinx can be plainly seen. The blood supply of the tube is then secured by a series of ligatures, usually three, from the outer to the inner extremity, placed close to the under surface of the tube, so as to disturb the ovarian branches as little as possible

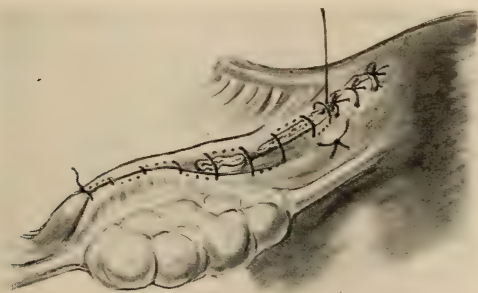


FIG. 390.—Salpingectomy. Peritonealization, when shortening of round ligament is not required.

As a rule, there is an outer, a middle, and an inner uterine branch to be secured (see Fig. 388). The mesosalpinx should be divided along the line of its attachment to the tube. The tube is separated from the uterine cornu by a wedge-shaped incision. The incision is closed with interrupted sutures (Fig. 389). Bleeding points are caught and tied individually and the raw surface of the mesosalpinx is turned in with a continuous suture (Figs. 390, 391, and 392).

Salpingostomy.—After the usual preparations—median abdominal incision and isolation of the affected part—the diseased outer portion of the tube is cut away. The division of the peritoneal coat and the division of the mucosa are made in different planes, so that the mucosa will project slightly beyond the serosa. The line of excision should be oblique to the long axis

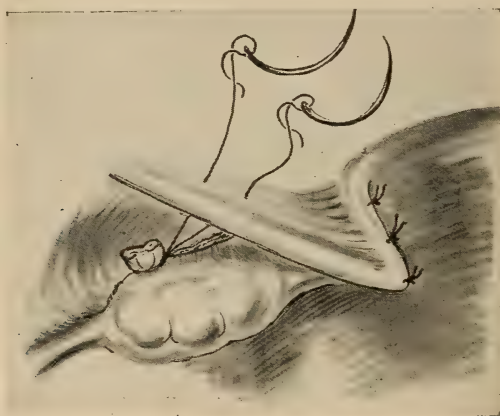


FIG. 391.—Salpingectomy. Peritonealization, with shortening of round ligaments, first step.

of the tube. The mucous membrane lining the tube is then united to the outer peritoneal surface by a series of interrupted sutures of fine catgut (Fig. 380). A fine probe should be passed as far as the isthmus to demonstrate that the tube is patulous. It is usually impracticable without trauma to pass the ordinary surgical probe even of small caliber beyond that point



FIG. 392.—Salpingectomy. Peritonealization, with shortening of round ligaments, second step.

even in normal tubes. The tube should be washed out thoroughly with sterile salt solution.

Vaginal Incision and Drainage.—After the usual preliminary preparations, the site of the abscess is accurately located by means of bimanual palpation. The posterior lip of the cervix is grasped with a tenaculum and steadied, and a transverse incision is made back of the cervix at the reflexion of the posterior vaginal fornix (Fig. 382). The finger is then introduced

into the cellular tissue, and a further careful palpation made. After the site of the proposed puncture has been accurately located, the end of a sharp-pointed curved scissors is thrust into the objective point. A characteristic sensation will be imparted to the hand as the point of the scissors enters the abscess cavity. The blade of the instrument is separated as it is withdrawn, thus enlarging the opening (Fig. 383). After the evacuation of the pus a T-shaped soft-rubber drainage tube is introduced, and packing is placed in the vagina to hold the tube in position.

BIBLIOGRAPHY

- ANSPACH, B. M.: "Inflammatory Diseases of the Pelvis." *International Clinics*, 1917, ii, 27th Series.
- BALDY, J. M.: "Hysterectomy for Suppurative Disease of the Pelvic Organs." *Am. Gyn. and Obst. Jour.*, Sept., 1895.
- BERNUTZ: *Pelvic Peritonitis*, Clinical Memoirs of the Diseases of Women. Bernutz and Goupil, vol. xi, New Sydenham Soc., London, 1867.
- BUBLITSCHENKO: "Über Sepsis puerperalis Staphylococcia." *Zent. f. Gyn.*, 1914, xxxviii.
- EMMET, T. A.: "Pelvic Inflammations or Cellulitis *versus* Peritonitis." *Trans. Amer. Gyn. Soc.*, 1887, ii, 101.
- GELFHORN, G.: "Salpingostomy and Pregnancy." *Trans. Amer. Gyn. Soc.*, 1911, xxxvi, 186.
- HARRAR, J. A.: "Puerperal Infections." *Bull. N. Y. Lying-In Hosp.*, 1911, p. 166.
- ILL, E. J.: "The Cause, Diagnosis and Nonsurgical Treatment of Pelvic Inflammation." *Amer. Gyn. and Obst. J.*, Sept., 1900.
- KELLY, H. A.: "Vaginal Drainage for Pelvic Abscess." *Kelly and Noble, Gynec. and Abdom. Surg.*, i, xviii; *Ibid.*: "The Removal of Pelvic Inflammatory Masses by the Abdominal Bisection of the Uterus." *Amer. J. Obst.*, 1900, xvi.
- MARTIN: *Die Krankh. des Beckenbindegewebes u. des Beckenbauchfells. Handb. der Krankh. der Weib. Adnexorgane.* Berlin, 1906.
- MILLER, quoted by KELLY: *Operative Gynecology*, 1899, vol. ii, p. 211.
- MILLER, G. B.: "The Occurrence of the Streptococcus Pyogenes in Gynecological Diseases." *Amer. Jour. Obst.*, 1899, xxxix, 780.
- MILLER, H., AND CHALFANT, S.: "Treatment of Puerperal Blood-stream Infection by the Means of Arseno-Benzol." *Trans. Amer. Gynec. Society*, 1918, p. 269.
- MARMOREK: "Sur le Steptococque." *Comptes rendus de la Soc. de Biol.*, 1895, 10 me. Serie ii, 122; *Ibid.*: "Streptococque et le Sérum Antistreptococque." *Annales de l'Institut Pasteur*, 1895, vol. ix, p. 593.
- NOBLE, C. P.: "Puerperal Pelvic Cellulitis and Puerperal Peritonitis." *Amer. Gyn. and Obst. Jour.*, Jan., 1895.
- POLAK, J. O.: "The Preservation of the Menstrual Function." *Jour. A. M. A.*, 1917, lxi, 1938; *Ibid.*: "Observations of Two Hundred Twenty-seven Cases of Ectopic Pregnancy." *Amer. Jour. Obst.*, 1915, lxxi, 946; *Ibid.*: "Preservation of Menses in Double Suppurative Disease of the Adnexa." *Trans. Sec. O. G. and A. S.—A. M. A.*, 1917, p. 174.
- POLK: "Hysterectomy (Suprapubic) for Salpingitis and Ovaritis." *N. Y. Jour. Gyn. and Obst.*, Dec., 1893.
- POZZI: "De la résection et de l'ignipuncture de L'ovaire." *Rev. de Gyn.*, 1897.
- SIMPSON: "A Precise Method of Choosing a Safe Time for Operation in Pelvic Inflammation of Tubal Origin." *Trans. Amer. Gyn. Soc.*, 1915, xi, 166; *Ibid.*: "Choice of Time for Operation for Pelvic Inflammation of Tubal Origin." *Trans. Amer. Gyn. Soc.*, 1909, p. 161.
- TAIT: *Diseases of Women and Abdominal Surgery.* Phila., 1889.
- WILLIAMS, J. W.: *Obstetrics.* N. Y., Appleton, 1903.

CHAPTER XXII

DISEASES OF THE URETHRA

URETHRITIS

Etiology.—Urethritis, or inflammation of the urethra, is due, in the majority of cases, to direct gonorrhœal infection during coitus. Urethritis may also be caused by infection resulting from the introduction of an unclean catheter or sound. Irritation from the use of strong chemical solutions and the trauma incident to difficult labor may be factors in the production of urethritis. In urethritis caused by the gonococcus the disease passes through an acute stage and then gradually becomes chronic. Urethritis due to other forms of infection and secondary to irritation caused by powerful chemical solutions or to traumatism, almost never becomes chronic, and tends to undergo spontaneous and complete cure. Both acute and chronic urethritis may be associated with involvement of the bladder.

ACUTE GONORRHOËAL URETHRITIS

Symptoms.—As the female urethra is comparatively short, the symptoms are not so violent as are those of acute gonorrhœal urethritis in the male. The most common symptom is a frequent desire to empty the bladder. Urination is accompanied by a burning and scalding pain, followed, in the most severe cases, by the passage of a small quantity of blood. There is a purulent discharge from the urethra, which irritates the vestibule and the surrounding vulvar mucous membrane. There may be slight elevation of temperature.

Diagnosis.—On inspection the external meatus is found to be reddened and swollen, and filled with a purulent discharge. At times the mucous membrane is seen to bulge, as in urethral prolapse. Upon making pressure along the under surface of the urethra at the vaginal introitus pus may be expressed from the urethra or from Skene's tubules (Fig. 115). Immediately after urination the urethra may be free from purulent discharge, but pus may usually be expressed from Skene's tubules or other crypts in the urethral floor near the meatus.

Prognosis.—After a few days, as a rule, the subjective symptoms become less violent, the formation of pus decreases, and the other local manifestations of inflammation subside. In the course of a few weeks the urethra may to a great extent rid itself of the disease, but the infection is likely to persist in Skene's tubules and in the crypts and lacunæ along the floor of the urethra.

Treatment.—Acute gonorrhœal urethritis may be followed by cystitis, but this is not especially likely to occur unless the patient is catheterized or local applications are made to the urethra. For this reason local treatment of the urethra during the acute stage of gonorrhœal urethritis is absolutely contraindicated. The patient should be placed upon a bland liquid diet, and

be instructed to drink large quantities of water. A mild urinary antiseptic, such as salol, combined with a diuretic salt, to render the urine as bland as possible, should be prescribed. For this purpose such a combination as salol and sodium bicarbonate is of particular value. If the urethritis is accompanied by vulvitis, the treatment outlined in Chapter XI, page 167, may be combined with that just described.

Other Forms of Acute Urethritis.—Acute urethritis, the result of streptococcus, diphtheritic, or virulent staphylococcus infection, may rarely be observed as a part of instrumental, post-abortion, or post-partal infection, and is usually accompanied by severe systemic disturbance. In these cases no treatment directed specifically toward the urethra itself is required. A urinary antiseptic, such as hexamethylenamine, may be prescribed. The

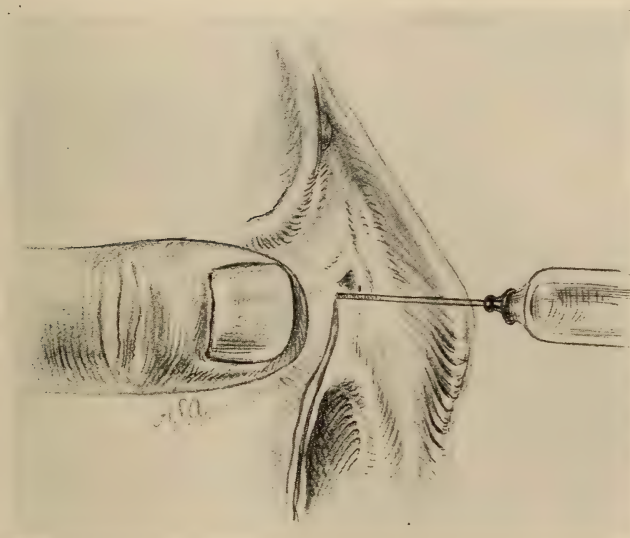


FIG. 393.—Disinfection of Skene's tubules with hypodermic syringe and blunt needle.

patient should be encouraged to drink large quantities of water, and general supportive treatment should be instituted. Acute urethritis due to powerful chemical irritants, such as strong solutions of silver nitrate, phenol, or mercury bichloride, in the early stage requires no treatment beyond rest and the administration of soothing diuretic mixtures. The patient should be given large quantities of water, and combinations such as have been suggested for acute gonorrhœal urethritis should be prescribed. As the disease subsides and the purulent discharge disappears the occasional passage of a well-lubricated urethral sound may prevent the formation of a stricture.

CHRONIC GONORRHOËAL URETHRITIS

Acute gonorrhœal urethritis subsides in the course of a few weeks, to be followed by the subacute and later by the chronic stage. If no treatment whatever is instituted, the manifestations of the disease be-

come progressively less and the subjective symptoms may even disappear entirely. At this time the urethral mucosa throughout the greater part of its extent has become restored to its normal condition. In the crypts of the urethral floor, toward the external urinary meatus, and in Skene's tubules the disease persists, and the infectious products are from time to time discharged from these foci into the urethra. Under such circumstances the acute symptoms of urethritis may be relighted by certain forms of irritation (unfamiliar coitus, alcoholic excesses); it may extend to other parts of the genital tract, or it may be transmitted to another person.

Symptoms.—There may be no subjective symptoms. As a rule, there is frequency of urination accompanied by pain during or after the act, and the patient may be conscious of a slight moisture or discharge about the vestibule.

Diagnosis.—The diagnosis of chronic gonococcal urethritis is dependent upon the presence of pus in the urethra or in Skene's tubules, about the external urinary meatus, and the demonstration of the gonococcus in stained smears. If the patient uses a vaginal douche or empties her bladder immediately before the examination, the evidence of chronic urethritis may be destroyed. The examination should, therefore, be made while the bladder is full and without preparatory douching. In the majority of cases inspection of the meatus shows an everted, reddened, granular mucosa, with the orifices of Skene's tubules exposed to view. The reddening of the mucosa may be limited or especially pronounced in the immediate vicinity of the orifices of Skene's tubules, with the formation of the so-called gonorrhœal macules. At times, especially in nulliparæ, the lips of the meatus must be separated to expose the orifices of the tubules, but this is exceptional. The meatus and the surrounding mucosa of the vestibule should now be cleansed of surface discharge; the examiner's finger should be inserted its full length into the vagina, and the contents of the urethra milked out by forward pressure upon the anterior vaginal wall. A whitish, creamy, or thin, murky discharge will be expressed from the urethra itself, from Skene's tubules, or from lacunæ in the floor of the urethra just within the orifice. Smears of this discharge should be made as described on page 123.

In cases giving rise to symptoms, or in those in which the process has recently been relighted by unaccustomed sexual intercourse or other forms of irritation, the gonococcus will usually be unmistakably recognizable. In mixed infections, or in the very old, latent cases in which no symptoms are manifest, it may be impossible to demonstrate the presence of the gonococcus. Under such circumstances the complement-fixation test may be applied. If this is not available, the diagnosis must rest on the clinical evidences of the disease (see *Gonorrhœa*, page 556).

A whitish discharge from the urethra is not always purulent, but may be made up almost entirely of desquamated epithelium. This is especially prone to occur in chronic cases that have been exposed to active local treatment.

Treatment.—The treatment of subacute or chronic gonorrhœal urethritis consists of the administration of urinary antiseptics and direct applications of gonococicides to the urethra.

The bland refrigerant diuretics prescribed in the acute stage should be replaced by hexamethylenamine and sodium benzoate, or by the oil of sandalwood and copaiba.

Local Treatment.—Local treatment should be carried out by the physician, for it is impracticable for the patient to apply it herself. In the subacute or chronic stage the disease is confined largely to the vicinity of the external meatus. This local treatment consists, first, of massage, applied for the purpose of emptying the urethra and all the urethral crypts of discharge, the manipulations being made through the anterior vaginal wall, and performed at a time when the bladder is full. After the urethra and the crypts have been emptied of pus, the patient is instructed to urinate, thus washing clean the urethral mucosa. By means of a blunt-pointed hypodermic needle Skene's tubules may then be injected with a solution of ichthyol, argyrol, or silver nitrate (Fig. 393). The tubules or crypts are located, the blunt needle carefully introduced as far as it will go, and the crypt washed out first with sterile water. As a gonocide there is nothing superior to silver nitrate, the solutions varying in strength from 2 to 10 per cent. Later normal salt solution may be injected to inhibit the action of the silver nitrate.¹

Argyrol (20 per cent.) and protargol (1 to 5 per cent.) are valuable gonocides, and may be used instead of the silver nitrate. Ichthyol (25 to 50 per cent.) and Churchill's tincture of iodine are also reliable preparations.

The urethra itself may now be treated. The hypodermic syringe should be fitted with a probe-pointed cannula of small caliber and two inches in length. The cannula is passed to the neck of the bladder, which is compressed by a finger in the vagina, and the urethra is flushed with sterile water. This maneuver is repeated several times, each withdrawal of the cannula being followed by gentle massage. The solution of gonocide is now injected, care being taken to compress the vesical end of the urethra beyond the point of the cannula. For this purpose one of the following preparations may be used: Silver nitrate (2 to 10 per cent.), followed by salt solution; argyrol (20 per cent.); protargol (5 to 20 per cent.); iodine (2 to 5 per cent.); ichthyol (10 to 50 per cent.). In order to further the action of the antiseptic, a urethral tampon saturated with a bland antiseptic solution should be applied (Fig. 394). The tampon is made by rolling a thin layer of cotton loosely upon the end of an applicator. The entire length of the tampon should not be over one and one-quarter inches. It is moistened with the solution, and introduced by means of the applicator into the urethra, up to the internal urinary sphincter. The applicator is then withdrawn. From ten to fifteen drops of the solution are now injected into the urethra by means of the probe-pointed cannula or blunt hypodermic needle (Fig. 395), the tampon taking up the injected fluid, and securing a more or less continuous application of the remedy to the urethral

¹ For the injection of silver nitrate an all-glass hypodermic syringe should be used in preference to the all-metal or partly metal ones, since the precipitate formed by the action of the silver nitrate on the metal will obstruct the lumen of the needle. For the same reason silver solution should not be allowed to remain in contact with the needle for any length of time. After injecting the solution the needle should be flushed out and a stylet introduced.

mucosa until the next act of urination, when it is expelled. The urethral tampon may be saturated with any of the solutions mentioned, but where silver nitrate or iodine is employed, weak solutions (1 per cent.) must be used at first, and the effect carefully noted before their strength is increased. As a rule, it is better to use silver nitrate and iodine for the urethral injection, and argyrol, protargol, or ichthyol for the tampon. The treatment should be repeated daily, or as often as is practicable, in order quickly to rid the patient of the disorder and prevent it from becoming chronic. As a result of this treatment the discharge becomes diminished in amount, and a microscopic examination shows that many epithelial and few pus-cells are present, while the gonococci are few in number. At this stage it is well to substitute a slightly astringent antiseptic solution, such as zinc sulphate (15 grains), powdered burnt alum (15 grains), phenol (4 grains), water (enough to make 4 ounces). Careful treatment, repeated at intervals, and

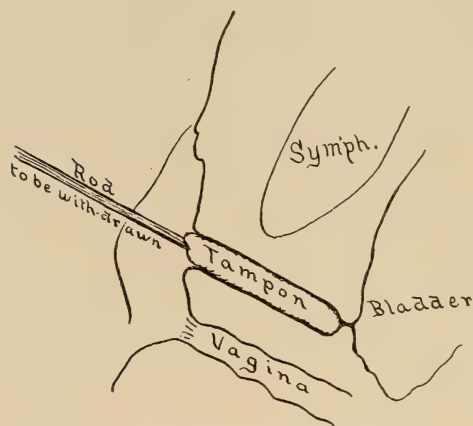


FIG. 394.—Urethral tampon in position.

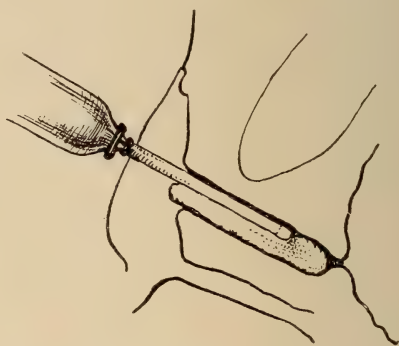


FIG. 395.—Saturating urethral tampon with hypodermic syringe and bulb cannula.

the avoidance of reinfection are almost certain to effect a cure. In those persistent cases in which it seems impossible, in spite of treatment, to free Skene's tubules of the infection, a favorable result may be secured by laying them open freely with a sharp bistoury and cauterizing with pure phenol. (For the vaccine treatment of chronic gonorrhœal urethritis see Chapter XLI.)

Other Forms of Chronic Urethritis.—A form of chronic posterior urethritis, with or without contraction or stricture formation of large caliber, is declared by Hunner to be the sequel of infection and inflammation of the tonsils and accessory nasal sinuses, teeth, gastro-intestinal tract, etc. In these cases the urethritis may be difficult to explain on other grounds in virginal, chaste women. The urethroscopic picture and symptoms are not characteristic. The condition is quite amenable to local treatment—*e.g.*, dilatation of the urethra and the application of silver nitrate—but recurs at more or less frequent intervals. Removal of the focus of infection has given very striking results in some of Hunner's cases.

SUBURETHRAL ABSCESS

Etiology.—A suburethral abscess results from infection of a suburethral crypt, with subsequent complete or partial blocking of the communication of the crypt with the urethra. The collection of pus lies within the floor of the urethra, in close approximation to the anterior vaginal wall. The size of the abscess is, on the average, that of a marble, but it may vary in dimensions from a pea to an egg.

Symptoms.—The subjective symptoms are similar to those of acute or chronic urethritis, but are somewhat exaggerated, depending upon the extent of the disease. In addition there is a feeling of fullness and distress in the affected parts, entirely independent of urination.

Diagnosis.—By palpation the abscess may readily be detected as a tender nodule or globular tumor embedded in the urethrovaginal septum. In the case of larger abscesses there may be a considerable projection of the mass into the vagina. Upon passing a fine probe along the floor of the urethra the original opening of the crypt may occasionally be found, and the probe introduced through it to the bottom of the sac, where the end of the probe may be felt by the vaginal finger. The mouth of the infected crypt may be brought into view by means of the urethroscope, and pressure on the sac may result in the escape of pus into the urethra.

Treatment.—When a communication can be found with the urethra and the sac is small, the pus may be evacuated by gentle pressure, and a cure effected by keeping the crypt open and using repeated injections of antiseptic solutions. If the sac is of considerable size, however, a cure will not be obtained without free drainage, and this can best be secured by making vaginal incision. The pus should be evacuated and the interior of the sac swabbed with pure phenol and allowed to heal by granulation. If the communication between the abscess and the urethra is completely sealed, the sac should be enucleated from the vaginal side, without rupture, if possible, and the wound immediately closed.

URETHRAL FISSURE

Urethral fissure usually occurs at the internal urinary meatus, and consists of a linear crack or ulcer in the mucosa embraced by the sphincter muscle.

Etiology.—The condition results from urethritis or traumatism, such as follows repeated catheterization or the passage of a calculus. It is similar to a fissure *in ano*, and may be as troublesome and as persistent. The vesical sphincter is usually hypersensitive and spastic.

Symptoms.—The symptoms consist of pain after urination, with or without a frequent desire to repeat the act. The urine may contain red blood-cells.

Diagnosis.—The diagnosis may be made by means of a cylindric (Kelly) cystoscope. The instrument is passed into the bladder, the urine is evacuated, and the speculum is slowly withdrawn. As the internal meatus closes over the end of the speculum the fine linear fissure or fissures may be discerned. Gentleness, to avoid traumatism, an excellent light, and

small pledgets of cotton for sponging are essential to success. The treatment consists in overstretching and temporarily paralyzing the vesical sphincter by the passage of a sound several sizes too large. This procedure alone may be sufficient. If it is not, in addition to the passage of the sound the fissure should be painted with a solution of silver nitrate, or the muscle may be incised with a small, delicate, especially constructed knife. Usually, however, such heroic treatment will not be required.

PROLAPSE OF THE URETHRAL MUCOSA

Etiology.—The mucosa of the urethra may become loosened from the underlying tissues and protrude through the external urinary meatus (Fig. 397). This condition is commonly a late result of injury received during labor. It is usually accompanied by other evidences of traumatism, such as

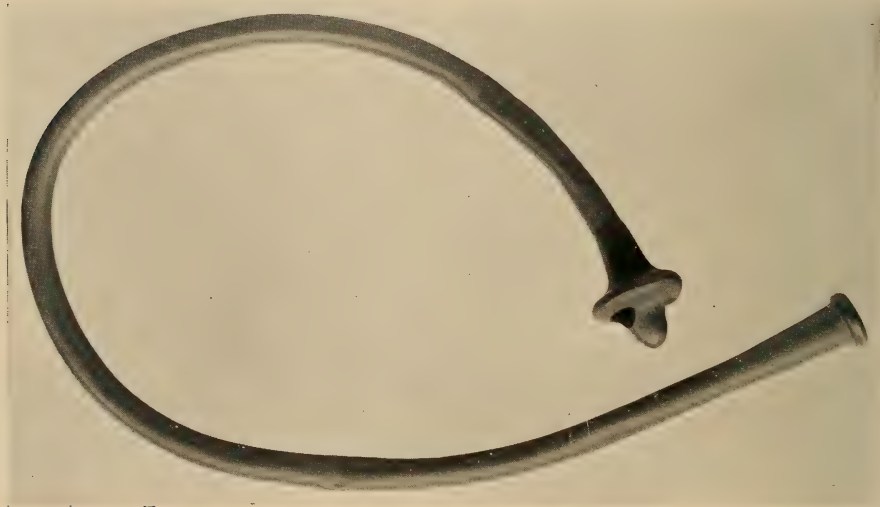


FIG. 396.—Self-retaining or mushroom catheter.

vaginal scars in the anterior or posterior wall, cystocele, and rectocele. The associated lesions often are slight and manifest no symptoms. Prolapse of the urethra is seen especially about the time of the menopause, when there is a certain amount of atrophy and shrinkage of the vulvar parts. Prolapse of the urethral mucosa may be a complication of urethritis, or it may follow long-continued cystitis or vesical tenesmus. In some cases occurring in virgins, the causative factor cannot be determined.

Symptoms.—There may be few or no symptoms or the prolapsed mucosa may be exquisitely tender and sensitive and give rise to an almost constant desire to urinate, pain and soreness accompanying the act. These cases resemble closely those of urethral caruncle, and, indeed, in some, in addition to prolapse of the entire circumference of the meatal mucosa, there is a localized and sensitive hypertrophy that resembles a caruncle.

Treatment.—In mild cases the prolapsed and sensitive mucosa may be treated with silver nitrate (10 per cent. solution) followed by the applica-

tion of a soothing ointment. In marked cases the parts should be cocainized and the protruding mucosa ligated in sections and snipped off. When the prolapse is extensive, general anæsthesia may be induced, and excision of the prolapsed mucosa, followed by the formation of a new external meatus, carried out. Care should be taken, in the construction of the latter, to obviate the tendency to protrusion of the mucous membrane. This may be done as indicated in the accompanying illustrations (Figs. 397 to 399). When the prolapse of the mucosa is complicated with a cystocele or other lesions of the adjacent structures, such as cystitis, urethritis, etc., appropriate treatment for these conditions should be instituted.

URETHRAL DILATATION

Etiology.—The urethra may possess an abnormally large lumen congenitally, but dilatation of the urethra, as a rule, results from various forms of traumatism. When the external genitalia are defective, *e.g.*, when there is atresia of the vagina, etc., repeated attempts at copulation in rare instances result in a gradual dilatation of the urethra. This may become so marked that the penis may enter the bladder during coitus. Copulation per urethram has been said to be compatible with excellent control of the bladder. In one case recently observed, the urethra had been split bilaterally back to the internal urinary meatus, the resulting passage being used regularly for copulation, in spite of the fact that the patient suffered from constant dribbling of urine.

Urethral dilatation occurs most commonly in the child-bearing woman, and is caused by lacerations of the urethral musculature, especially of the fibers at the internal urinary meatus, and by the loss of support normally afforded to the urethra by the anterior vaginal wall. Other causes may be: An overstretching of the canal, with rupture of some of the circular muscle-fibers, as from the passage of a cystoscope or sound that is too large. A stricture or a new growth of the urethra or of the neighboring parts that

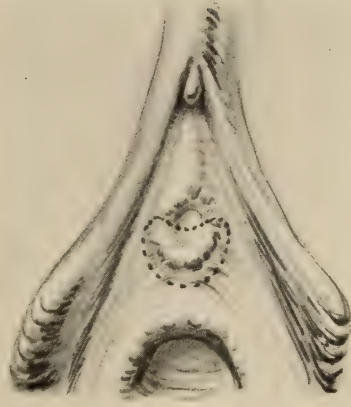


FIG.
397



FIG.
398

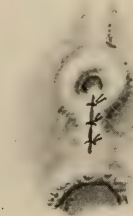


FIG.
399

FIG. 397.—Prolapsed urethral mucosa. Outline of denudation.

FIG. 398.—Prolapsed urethral mucosa. Denudation completed.

FIG. 399.—Prolapsed urethral mucosa. Sutures introduced.

impedes the expulsion of urine may produce a dilatation of the urethra behind the point of obstruction. Incontinence of urine due only to a lesion of the vesical sphincter is relatively infrequent. Incontinence due to a lesion of the sphincter plus other pelvic lesions is frequent.

Symptoms.—The most common symptom of dilatation of the urethra is an inability to control the passage of urine. In the usual type, *i.e.*, that seen in the child-bearing woman, any sudden or violent increase of intra-abdominal pressure, such as is induced by lifting, coughing, sneezing, or laughing, will be followed by a more or less free and continuous leakage of urine. In some instances a perineal dressing must be worn almost constantly.

Diagnosis.—In a majority of cases the external orifice gapes widely, exposing the mucosa of the interior. The neighboring parts are erythematous from the constant moisture, and coughing, bearing down, etc., result in dribbling of urine. A sound is passed without difficulty, and the external urinary meatus will admit a much larger sized instrument than under normal conditions, *e.g.*, Nos. 28 to 30 F. An acorn bougie will help determine whether the condition is localized or general. In the ordinary case the dilatation is particularly noticeable at the external urinary meatus, and there are associated lesions that have been produced by the same agency that caused the urethral dilatation, *viz.*, the traumatism inci-

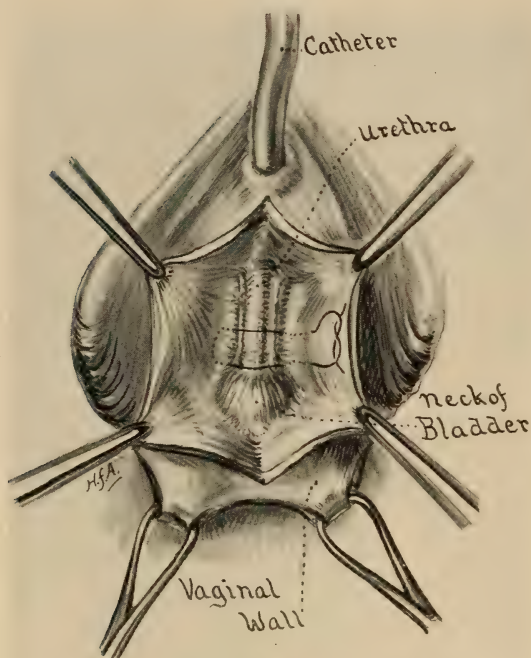
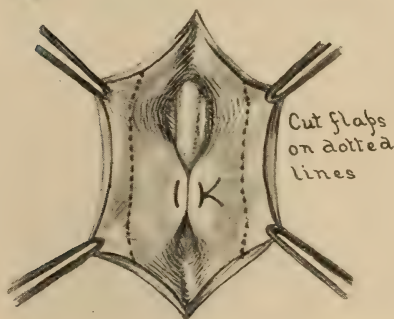
FIG.
400FIG.
401

FIG. 400.—Operation for relaxation of vesical neck of urethra. First step; mucosa dissected and a mattress suture inserted. FIG. 401.—Operation for relaxation of vesical neck of urethra. Second step, mattress suture tied, outline for removal of redundant mucosa.

dent to labor. There is almost always some degree of cystocele and rectocele. The vaginal outlet may be moderately or excessively relaxed, and the uterus is often in a state of descensus or prolapse.

Treatment.—In the very rare cases of excessive dilatation of the urethra resulting from coitus per urethram, an effort must be made to restore the

vagina (see Atresia, page 28) and then to narrow the urethral canal by performing plastic operations, to be described further on.

In the common form of urethral dilatation, that due to injuries received during labor, the associated conditions of relaxation and displacement must be corrected. Temporary relief is often secured by the wearing of a pessary, which replaces and supports the sagging parts and compresses the lumen of the urethra.

The surgical treatment of the urethra itself consists in reduplicating its inferior wall by sutures passed through the adjacent tissues and tied in the median line, as in the operation for cystocele (Chapter XIII). This is the general principle of lessening the caliber of the urethra and giving support to the structures. It should be supplemented by the plan here outlined, of locating accurately the vesical sphincter and endeavoring to catch in the grasp of the sutures the actual muscle fibers of the sphincter (Figs. 400 and 401). In addition to the infolding of the vesical sphincter, care should be observed to remove all dragging or downward traction on the anterior vaginal wall.

If the external urinary meatus is dilated and the mucosa exposed, the orifice should be resected, as shown in the accompanying illustrations (Figs. 397 to 399). The operations upon the urethra should be supplemented by an anterior colporrhaphy (Chapter XIII).

STRICTURE OF THE URETHRA

Etiology.—Whereas the external meatus may be very small congenitally, acquired stricture of the urethra is most uncommon in the female. It may result from a severe urethritis, from traumatism inflicted during labor or by instrumentation, or it may follow destructive cauterization or disinfection of the urethral mucosa. It may occur in any part of the urethral canal.

Symptoms.—The symptoms are a frequent desire to urinate, with difficulty in expulsion, accompanied by pain and vesical tenesmus. A certain amount of residual urine is often constantly present.

Diagnosis.—The diagnosis is made as the result of the passage of sounds or acorn-tipped bougies.

Treatment.—The treatment consists in performing gradual dilatation. This is usually readily accomplished, as the female urethra is comparatively short. In obstinate cases forced divulsion under general anæsthesia, with frequent passage of the sound during convalescence, may effect a cure; or a permanent catheter may be left *in situ* until healing has occurred.

URETHRAL CARUNCLE

A urethral caruncle is a small tumor springing from the urethral mucous membrane at the site of the external urinary meatus. It is often flattened from side to side, presenting the appearance of a cock's comb (Fig. 402). Its long diameter, as a rule, lies in the median line, and it usually springs from the posterior urethral wall. It is seen most commonly in women of mature years.

Symptoms.—The tumor is exquisitely sensitive to touch, and urina-

tion is accompanied by severe, sometimes excruciating, pain. Urethral caruncle often simulates prolapse, or a redundancy of the urethral mucosa at the site of the external urinary meatus. The size of a caruncle is not in direct proportion to the amount of pain it induces, a large growth sometimes being accompanied by very few symptoms, whereas a small one may be exceedingly tender. The caruncle ranges in size from a pinhead to a hickory-nut, and its color varies from a pale to a bright red. The tumor may be sessile or pedunculated, and bleeds easily.



FIG. 402.—Urethral caruncle (Dr. Philip Williams, Presbyterian Hospital). Detail shows base attached to floor of urethra.

Treatment.—The treatment consists of removal of the tumor. For this purpose infiltration anæsthesia with novocaine ($\frac{1}{4}$ per cent.) and adrenalin may be sufficient; but in nervous hyperæsthetic individuals, or when the pain is excruciating, a general anæsthetic should be given. The growth may be either excised from the mucosa by a V-shaped incision, and the resulting wound sutured with fine catgut, or, if it is pedunculated, the pedicle may be ligated close to its base and the tumor snipped off.

Redundancy and prolapse of the urethra, simulating in appearance small urethral caruncles, are not infrequently encountered in old multiparæ. This swollen mucous membrane is exquisitely sensitive and painful at times, whereas at other times it gives rise to no symptoms whatever (see Urethral Prolapse, page 446).

NEW GROWTHS OF THE URETHRA

Benign tumors, such as mucous polypus, fibroma, myoma, and fibromyoma, are rarely encountered. The symptoms consist of frequent, painful, and difficult urination, simple inspection, digital examination, or the urethroscope revealing the presence of the tumor in the wall of the urethra. Enucleation and plastic repair constitute the treatment.

Malignant tumors, such as carcinoma and sarcoma, are occasionally seen. Carcinoma is usually secondary to carcinoma of the clitoris or vestibule, but it may be primary in the meatus. Crossen has collected twenty-five cases of primary urethral carcinoma. Sarcoma is the rarest of all urethral tumors.

Symptoms.—The symptoms of carcinoma and sarcoma of the urethra consist of frequent and painful urination and hæmaturia. The growth usually presents at the external meatus and is surrounded by an area of induration. A positive diagnosis can be made only as the result of a microscopic examination.

Treatment.—The treatment consists of excision; not infrequently, however, the growth is not discovered early enough to permit removal without extensive mutilation and resulting permanent incontinence of urine. Moreover, metastasis takes place directly into the deep glands of the pelvis. On account of the direction of the lymphatic drainage, the first metastasis makes recurrence certain, for the affected glands are beyond reach (Crossen). When the case is seen early, the following plan, described by Crossen, should be carried out:

First: The formation of a temporary vesicovaginal fistula for continuous drainage of the bladder; it should be placed in the median line, near the posterior margin of the trigone; a permanent catheter is introduced, and secured in place with a non-absorbable suture.

Second. The growth is excised, and with it the surrounding portion of the vestibule and the urethra and the periurethral tissues back to the bladder.

Third: The muscular tissue in the vicinity of the internal urinary meatus is now piled up above the opening by a series of two or three purse-string sutures of fine chromic catgut. A small catheter should be placed in the opening while the sutures are being tied. The mucosa should be kept carefully drawn out beyond the ring of piled-up tissue, so that it may subsequently be sutured to the transplanted flaps.

Fourth. Flaps for covering the raw surface are taken from the anterior vaginal wall. After being suitably disposed, they are sutured to each other and also to the stump of the urethral mucosa. (For further details the reader is referred to Crossen's paper.)

The prognosis in early cases, as collected by Crossen, is fair; thus, of

twenty-five cases in the literature, eight cures (three years old) and three probable cures (two years old) were reported. In fourteen there was recurrence or the patient had been lost sight of.

In all cases subjected to operation, radium should subsequently be used in an effort to avoid recurrence. In far-advanced cases radium is the only recourse, but it offers little hope of permanent cure.

BIBLIOGRAPHY

- CROSSEN: "Primary Cancer of the Female Urethra; Plastic Work and Late Results." Trans. Amer. Gyn. Soc., 1915, xl, 111.
- HUNNER, G. L.: "Diseases of the Bladder and Urethra." Kelly-Noble Gynecology and Abdominal Surgery, Saunders, Phila., 1917; *Ibid.*: "Chronic Urethritis and Chronic Ureteritis Caused by Tonsillitis." Jour. Amer. Med. Asso., April 1, 1911, lvi, 937-941.
- KEEFE: "Prolapse of the Female Urethra." Trans. Sect. O. G. and A. S., A. M. A., 1917, 131.
- KELLY, H. A.: "Incontinence of Urine in Women." Urol. and Cutan. Rev., June, 1913, xvii, 291.
- MILLER, G. B.: "Incontinence of Urine Following Labor." Trans. Amer. Gyn. Soc., 1909, 745.
- NITZE: Lehrbuch der Kytoscopie, 1889.
- PAWLIK, C.: "Ueber die Harnleitersondirung beim Weibe." Arch. f. Klin. Chir., 1886, xxxiii, 717-739.
- SIMON: Über die Methoden die weibliche Urinblase zugänglich zu machen und über die Sondirung der Harnleiter beim Weibe. Samml. klin. Vorträge, Volkmann, Leipzig.
- SKENE, J. C.: "The Anatomy and Pathology of Two Important Glands of the Female Urethra." Amer. Jour. Obst., 1880, xiii, 265.
- TAUSSIG: "Urethral Bacteria as a Factor in the Etiology of Cystitis in Women." Amer. Jour. Obst., October, 1906.
- TAYLOR, H. C., AND WATT, C. H.: "Incontinence of Urine in Women." Surg., Gyn. and Obst., 1917, No. 3, xxiv, 296.

CHAPTER XXIII

DISEASES OF THE BLADDER

CYSTITIS

CYSTITIS, or inflammation of the bladder, may be caused by direct and primary infection of the organ, resulting from the introduction of unclean instruments, as in catheterization after labor or following operation. The condition may follow the extension backward of a urethritis. It may be secondary to an infection of the kidney (pyelitis), or may result from infection after injury to the bladder mucosa by strong antiseptic solutions, by rough catheterization, or by operations upon adjacent parts during which the bladder has been traumatized. It may have its origin in the retention of urine following displacements of the uterus or obstruction to the urinary outflow by the pressure of extravescical tumors. It may be the result of the damage that has been caused by a neoplasm or a vesical calculus. Rupture of extravescical collections of pus into the bladder may also be the causative factor. It has been stated that neither the introduction of microorganisms nor trauma alone is sufficient to produce cystitis—that both must be combined. The most common organism found in acute cystitis is the colon bacillus, next in frequency being the gonococcus and the staphylococcus. In chronic forms the tubercle bacillus and the bacillus proteus also play a part. Cystitis may be acute or chronic.

ACUTE CYSTITIS

Etiology.—Acute cystitis of a mild type, limited to the trigone and rapidly subsiding under expectant treatment, is frequently observed in connection with acute gonorrhœal urethritis. The condition is also seen after operation, when the blood supply of the bladder has been disturbed and the mucosa has been traumatized. Acute cystitis may also follow septic and rough catheterization, but this is but rarely encountered as a cause at the present day. The condition may be secondary to and accompany an acute pyelitis.

Symptoms.—The symptoms of an acute cystitis are a frequent desire to urinate; burning pain during micturition, and a feeling afterward that the bladder has not been emptied; an uncontrollable desire to strain, and possibly the passage of a little blood. Combined with these manifestations there may be in the most severe cases (those due to septic catheterization), chilliness, elevation of temperature, and suprapubic and vaginal tenderness. The urine is turbid in appearance, acid in reaction, and contains a large amount of vesical epithelium, many bacteria, pus, and possibly blood.

Diagnosis.—At the beginning of the attack cystoscopic examination is very painful, and quite unnecessary. A presumptive diagnosis may be formulated from the symptoms, and treatment instituted. As the disease subsides or passes into the chronic stage, the cystoscope will be useful in con-

firming the diagnosis and in definitely locating the extent of the affection. In most cases the inflammation affects primarily the trigonum, the mucosa of which appears thickened, and its color a diffuse, intense red, the outlines of the individual blood-vessels being less distinct. In severe cases ecchymotic areas and superficial ulcerations may be noted.

Treatment.—The patient should be kept in bed. The diet should be limited to liquids, preferably milk. Large quantities of water should be taken. A refrigerant diuretic, such as the liquor potassi citratis, should be prescribed in full dose. Hot applications to the lower abdomen and perineum give relief, and the same is true of a prolonged hot vaginal douche. After the severity of the symptoms has abated somewhat, or in stubborn cases that show no improvement under the expectant plan of treatment, gentle irrigation of the bladder (Fig. 403) with warm normal salt solution may be advised; this often gives marked and speedy relief. The bladder should not be left empty after the irrigation, but partly filled with one or two ounces of a 10 per cent. solution of argyrol or a 5 per cent. emulsion of silver iodide. The patient should be directed to hold this solution as long as possible.

Prognosis.—Acute cystitis in the female usually yields rapidly to treatment, so that within a few days the patient will be comfortable. Treatment should be continued until all evidences of the disturbance have disappeared, and until cystoscopic examination and urinalysis reveal normal conditions. If the cystitis persists, the measures described in the treatment of chronic cystitis must be undertaken.

CHRONIC CYSTITIS

Etiology.—Chronic cystitis may be secondary to an acute cystitis due to any cause, but it is more likely to be the result of a mild but progressive infection associated with conditions that prevent free vesical drainage, as in cases of urethral stricture, cystocele, prolapse of the uterus, and compression of the urethra and distortion of the bladder by pelvic new growths. Hunner has recently described a form of persistent chronic cystitis apparently due to hæmatogenous infection of the vesical mucosa from distant foci. In this there are small linear ulcers, especially in the fundus of the bladder, and excision of the diseased area is often necessary to effect a cure.

The most severe form of chronic cystitis is the tuberculous. This condition is almost never primary, but follows tuberculosis of the kidney. A chronic cystitis that persists in spite of treatment is usually tuberculous. Rarely there may be infection with the bilharzia, distoma hæmatobium, and the echinococcus.

Symptoms.—The symptoms of chronic cystitis consist of frequent and painful micturition. The severity of the manifestations varies considerably in different cases. The urine is cloudy in appearance and contains pus. When the disease is of recent origin and secondary to acute cystitis of the infectious type (caused by catheterization or gonorrhœa), the urine may be acid in reaction. In tuberculous cystitis the urine is also acid. If the condition is largely the result of urinary retention and decomposition, and in most cases of long standing, the pus-cells are less numerous, but the urine

contains myriads of bacteria and has a foul, ammoniacal or stale-fish odor, due to the splitting of the urea content by the staphylococcus and the proteus vulgaris.

Diagnosis.—In cases of chronic cystitis produced by septic and traumatic catheterization or by gonorrhœa, cystoscopic examination usually shows that the principal seat of involvement is in the triangular area, bounded by the internal urethral orifice and the ureters, which is known as the trigone. In this area small, inflamed patches may be discerned, partaking of the nature of a superficial ulceration or a papillary erosion. The inflamed parts may be entirely confined to one area, usually that about the internal urethral orifice, or there may be discrete patches here and there over the entire trigonum and the surrounding region.

In cases of cystitis due to retention of urine, with secondary decomposi-

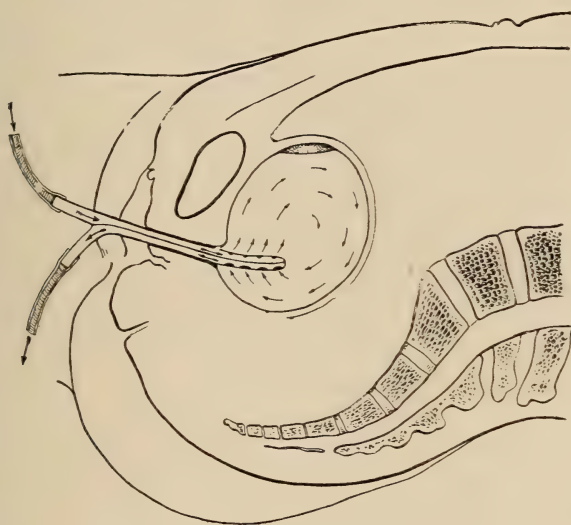


FIG. 403.—Irrigation of the bladder with a two-way catheter.

tion and infection, as in cystocele or prolapse, there is usually a diffuse reddening of the mucous membrane of the affected part of the bladder, and frequently this area shows precipitations of urinary salts, which at first sight give the impression of being purulent. Upon irrigating the bladder, however, these precipitates may be dissolved or washed away; microscopic examination will demonstrate their true nature. The urine contains pus-cells, myriads of bacteria, a considerable amount of mucus, and a large quantity of desquamated epithelium. Retention cystitis from urethral obstruction often results in hypertrophy of the bladder as a whole, and particularly of the muscular tissues of the bladder wall. Upon cystoscopic examination this condition is evidenced by a trabeculated appearance of the bladder wall, due to a hypertrophy of the muscular constituents, with a tendency to sacculation of the intervening areas. When the obstruction has been marked and persistent, this tendency results, in certain areas, in the formation of diverticula, which, at first sight, may resemble diseased,

open, and rigid ureteral orifices, and may be mistaken for them. Such diverticula are also due to congenital causes.

Treatment.—The treatment of chronic cystitis other than the tuberculous variety should consist in the use of an autogenous vaccine, the administration of urinary antiseptics, direct applications of cleansing and antiseptic solutions, and measures to correct conditions that produce urinary retention. Cultures most frequently show the colon bacillus and the staphylococcus. A vaccine should be prepared from the combined growth of whatever organisms are found. The most reliable urinary antiseptics are hexamethylenamine and salol. The former is the most effective. Since it acts best in an acid medium, it should be combined with sodium benzoate if the urine is weakly acid, neutral, or alkaline. Salol is effective in either acid or alkaline urine, but an attempt should, nevertheless, invariably be made to restore the normal urinary reaction. Copaiba and sandalwood are efficient in chronic gonococcus cystitis. Daily gentle irrigations of the bladder with nitrate of silver 1:10,000 followed by normal salt solution should be used, or the bladder should be irrigated with boric acid and 1 or 2 ounces of 10 per cent. solution of argyrol, protargol, or the emulsion of silver iodide left in the bladder. In obstinate cases ulcerated spots may be lightly curetted or touched with strong solutions of silver nitrate. After the local condition has improved, the sources of retention should be removed. Thus cystocele and prolapse should be subjected to operation, urethral stricture should be dilated, and tumors compressing or distorting the bladder or urethra should be excised.

Continuous drainage, such as can be provided by a vesicovaginal fistula, may be demanded when the case has resisted every other plan of treatment and the bladder has become intolerant of retention catheters. This method should be avoided except as a last resort. The formation of an artificial vesicovaginal fistula is a simple operation. The bladder should be filled with boric-acid solution and the anterior wall exposed with a Sims' speculum. A longitudinal incision, about three-quarters of an inch in length, is made exactly in the median line, through the vesicovaginal septum. This incision should bisect the trigonum without injuring the internal sphincter or the ureters. The edges of the vesical and of the vaginal mucosa should be united by sutures. When the mucosa has healed—usually at the end of about six weeks—such a fistula will require operation for closure. After making a vesicovaginal fistula for the purpose of securing permanent bladder drainage, care must be taken to see that the urine has ready exit from the vagina, or it will back up into the bladder. In nulliparous women and in virgins the vulvar outlet should be stretched or divided, if necessary, and the patient kept in the Fowler position.

TUBERCULOUS CYSTITIS

Etiology.—This is the most common and most serious form of chronic cystitis. Tuberculous cystitis is almost invariably secondary to tuberculosis of the kidney.

Pathology and Symptoms.—The condition develops insidiously. The first symptoms are increased frequency of urination and the presence of pus or blood

in the urine. Cultures of the urine usually show no growth. In early cases cystoscopic examination will generally reveal the fact that the bladder involvement is limited to the region of one ureteral orifice. The orifice is no longer linear, but, on account of the thickening and infiltration of the ureter, becomes rounded, open, and rigid, somewhat resembling in appearance a golf hole. The edge of the orifice may seem to be oedematous, or it may be dotted with small, grayish miliary tubercles; if the process is an older one, there may be ulcers; in the later stage ulceration becomes more extensive, the ureteral opening retracts, and the entire ureteral area is converted into a funnel-shaped depression covered with indolent granulation tissue.

The trigonum may be involved from the diseased ureteral orifice to the internal urinary meatus, the affection first appearing in the form of small grayish tubercles; or if the tubercles have broken down, discrete ulcerated areas are seen covered with a yellowish-gray slough or pus. The discrete appearance of these areas, surrounded by a mucous membrane that, except for the reddening, is but little altered, has been compared to footprints in freshly fallen snow.

In advanced cases of bladder tuberculosis there may be very extensive ulceration of the entire organ. This ulceration may have been followed by infiltration and contraction of the submucous and muscular coats, so that the normal capacity of the bladder has been very materially decreased, and cystoscopic examination at first is unsatisfactory, and no information can be ascertained from it. This is due to the fact that distention of the bladder and the introduction of the cystoscope are very painful, and the patient complains bitterly. The bladder admits of very little distention, and the mucous membrane is beset with ulcers covered with a grayish-yellow slough, or a thick yellow pus that conceals or marks the landmarks. After the ingestion of large quantities of fluids and following gentle irrigation of the bladder daily for a time, the cystoscopic picture is much clearer, and although there may be considerable ulceration, cedema, or distortion of the bladder, it is usually possible to distinguish both the ureteral orifices. If the cystoscopist is in doubt regarding them, he may have recourse to an injection of indigo-carmin, when the excretion of the colored urine will mark the ureteral site. The sensitiveness of the parts may be lessened by applying a 10 per cent. solution of cocaine to the urethra and by administering a preliminary injection of morphine ($\frac{1}{4}$ grain) and scopolamine ($\frac{1}{150}$ grain).

Diagnosis.—The gradual development of frequent and painful urination, a persistently acid pyuria, a rebelliousness to any form of treatment, a diminution in the capacity of the bladder, and an extreme sensitiveness are all suggestive of tuberculous cystitis. As a rule, there has been a previous indication, well marked or perhaps very vague, of a tuberculous focus elsewhere in the body. The positive diagnosis must be based upon the cystoscopic findings and upon the recovery of the tubercle bacillus from the bladder, as shown by the injection of guinea-pigs with the urinary sediment (recovery of the tubercle bacillus from the lymphatic glands), or the recognition of the bacillus in smears, as well as the detection of tuberculous infection in one or both kidneys.

Treatment.—The treatment of tuberculosis of the bladder is secondary in importance to that of tuberculosis of the kidney. After the tuberculous kidney has been removed there is usually a marked and continued improvement in the vesical condition. The improvement may be hastened by performing gentle irrigation of the bladder with warm salt solution and the instillation of iodoform in sweet oil. These instillations must be practised with great gentleness and care, the strength of the solution and the quantity instilled being gradually increased. The capacity of the bladder may be increased by encouraging the patient to retain the urine for as long a time as possible, and by making gentle hydrostatic pressure during the course of the irrigation. Direct application of strong solutions of silver nitrate to persistently ulcerated areas may be made through a Kelly cystoscope. Many methods of treatment have been suggested for the relief of tuberculous cystitis, but none of these is satisfactory unless the focus of infection in the kidney is eliminated. Many of the advanced cases never recover completely, and in some local treatment appears to aggravate rather than relieve the condition (see pages 111 and 473).

VESICAL CALCULUS

The surgeon is less often called upon to treat vesical calculus in women than in men, for the reason that the female urethra is short and that the stone is discharged while it is still small, and before it gives rise to symptoms.

Etiology.—The calculus may be the result of the agglutination of precipitated urinary salts, but often a foreign body of some sort serves as a nucleus about which the concretion is formed. Such a foreign body may have been introduced through the urethra, *e.g.*, the end of a catheter, a hair-pin, etc. Small papillomatous vegetations of the bladder mucosa, non-absorbable sutures introduced in the course of an operation through the mucosa, etc., may also form the nucleus of a vesical calculus.

Symptoms.—The symptoms are those of chronic cystitis, with which stones of any size are always complicated, plus an obstruction to the urinary outflow, manifested by a sudden cessation of the stream during the act of micturition.

Diagnosis.—Cystoscopic examination will at once reveal the presence of a vesical calculus if it lies free in the bladder, but if the stone lies within a diverticulum, it may easily be overlooked by the cystoscopist. When the calculus is of considerable size and free, a metal sound or a searcher introduced while the bladder is full, will elicit the characteristic feel of a hard body within and a clinking sound audible upon suprapubic auscultation. Large stones may often be felt upon making bimanual palpation. In strongly suspected cases, if the methods just outlined have failed to reveal a calculus, the Röntgen ray should be used.

According to Henry Pancoast: "The Röntgen examination for vesical calculus is also to be regarded as a most reliable means of diagnosis. The sources of error are somewhat greater than in calculus in the kidney or ureter, especially since uric-acid stones are more common. Occasionally very large uric-acid stones may cast no perceptible shadow in perfectly satisfactory röntgenograms. Soft phosphatic stones may also escape detec-

tion, especially in stout individuals and in those with thick bladder-walls. Large phleboliths, calcified lymph-glands, and fecal concretions are the usual objects whose shadows may cause confusion. The examination is valuable in detecting encysted stones that might readily escape discovery by the cystoscope or searcher. The Röntgen examination may be regarded as an efficient and reliable means of determining the presence, shape, and size of a vesical calculus, if it is borne in mind that negative findings do not always exclude stone."

"Diverticula in the bladder may be detected by injections of the opaque solutions used in pyelography—collargol, thorium nitrate, or sodium bromide."

Treatment.—The treatment of vesical calculus in females is simple. Stones of almost any size may be removed through an anterior vaginal incision. If the vaginal introitus is small, the suprapubic extraperitoneal route may be the preferable one. If the mucous membrane of the bladder is extensively ulcerated, continuous drainage should be provided for a time. This may be accomplished by the formation of a vesicovaginal fistula, but in most cases a self-retaining catheter will be sufficient. In any event, the treatment for chronic cystitis, which is always present, should be carried out.

HUNNER TYPE OF BLADDER ULCER IN WOMEN

Hunner describes a type of ulcer observed by him in twenty-five women, which differs in several ways from the solitary ulcer of Fenwick. There is no apparent cause for the ulcer, and the average age at which it appears is twenty years. It is always found on the summit, or free portion of the bladder, in contradistinction to the ulcer of Fenwick, which is found in the fixed portion or base of the bladder. The history is one of insidious onset, without apparent cause, and persistence in spite of various forms of treatment. All the cases have exhibited symptoms of chronic urethritis and some of them, remote foci of infection. The most characteristic feature is the insignificance of the lesion as compared with the prolonged duration and the intensity of the patient's suffering. Slight, smooth, white scars of former ulcerations, as well as moderate hyperæmia or inflammatory spots near the scars may be present. In other cases there is a small area of granulation that bleeds because of the distention of the bladder, or will bleed easily on being touched. The inflammatory spot may be surrounded by œdema. Macroscopically the urine from such a case appears normal, but under the microscope the centrifuged specimen will show a few leucocytes and red blood corpuscles. The diagnosis depends mainly on the resistance of the ulcer to the ordinary forms of treatment. The proper treatment of these cases consists in excising the ulcer through a suprapubic incision, operating extraperitoneally. (See Hunner's papers for further details.)

NEW GROWTHS OF THE BLADDER

Tumors of the bladder arise from the mucosa (epithelial) or the muscularis (connective tissue). The epithelial new growths, especially papilloma and carcinoma, are the most frequent, but cystoma and adenoma are also encountered. The connective-tissue neoplasms are myxoma, fibroma, sarcoma, myoma, and angioma. Dermoid tumor, rhabdomyoma, and chondroma constitute the mixed varieties.

Vesical tumors are more frequent in men than in women. Two-thirds of all bladder tumors are malignant.

Papilloma.—This is the most frequently observed vesical tumor seen in women. While some papillomata are benign, a large majority are malignant, and all should be regarded as malignant until proved otherwise by microscopic examination. Their most common seat is the base of the bladder. Papillomata are made up of branching papillæ; they are composed of a connective-tissue framework with a covering of epithelium made up of many layers. The growth may be pedunculate or sessile, and vary in size from a pinhead to an egg. They may be single, are often multiple, and rarely may be so numerous as almost entirely to fill the bladder.

Carcinoma.—Carcinoma of the bladder may be of papillary or of infiltrating form. In the early stage papillary carcinoma may be indistinguishable from benign papilloma except on microscopic examination. Infiltrating carcinoma penetrates the connective tissue of the bladder wall, forming flat, indurated nodes with ulceration of the superficial areas within the bladder.

Symptoms.—The commonest symptom of bladder tumor is hæmaturia. To this may be added difficulty in emptying the bladder or a sudden cessation of the stream, depending upon the relation of the new growth to the internal urinary meatus. In a large number of instances cystitis supervenes, and then urination becomes frequent and painful. Later, if ulceration or necrosis of the new growth takes place, there may be toxæmia, loss of weight, fever, etc.

The urine at first contains blood, the amount of which gradually increases as the case advances; pus, bacteria, and broken-down particles of the new growth are added later. The urine is alkaline and foul smelling, except when there is no retention.

Diagnosis.—The diagnosis of bladder tumor is dependent on cystoscopic examination. Papillomata with a well-defined, narrow pedicle are less prone to be malignant than are those with a broad base. An irregular, bossed, infiltrated, and ulcerating surface must be looked upon as malignant until it is proved otherwise.

The histologic examination of portions of the tumor excised or snared off by the cystoscopist may show certain evidences of malignancy; these have been described by Buerger. The objections to this plan are the production of hemorrhage and the danger of implanting small portions of the growth in other parts of the bladder. Probably the best method is to base the diagnosis on the cystoscopic appearance (narrow pedicle, without infiltration of the base in benign papillomata; broad pedicle or sessile tumors with infiltration of the bladder wall in malignant papillomata, etc.). If electrocauterization of a papilloma adjudged to be benign is not quickly followed by destruction and disappearance of the growth, malignancy should be suspected.

Treatment.—Benign papillomata should be treated by electrocauterization. When the pedicle is narrow, it should be the special object of attack, for if this is destroyed, the tumor will drop off. In sessile growths the application should be made all over the periphery of the tumor, so as to destroy as much as possible at one sitting. For the narrow-pediced villous

type of papilloma the Oudin current is preferable, because it sears over and destroys the delicate villi, with little or no consequent bleeding. The fibrous root of such and of all papillomata with broader pedicles requires the stronger D'Arsonval current. When marked hemorrhage takes place at each attempt at fulguration, or if the growth is inaccessible or the patient is intolerant, as well as in cases of papillomatosis, usually the result of multiple implantations following a previous operation, this method of treatment is impracticable. In these cases cystotomy should be performed and the tumors attacked directly with a cautery.

Malignant papillomata should be treated by electrocauterization plus radium.

Geraghty used 103.7 mgm. of radium in practically all his cases. A brass capsule was employed, so as to use both the gamma and the beta rays. The radium was applied directly to the growth, under full cystoscopic exposure. The séances usually consumed an hour, and were repeated from one to three times weekly.

Papillary carcinoma of the bladder is not amenable either to electrocauterization or to radium, unless the growth is exposed by a suprapubic incision (see Chapter XL).

If the growth is not too large, radical excision should be done, with transplantation of the ureter.

Excision of bladder growths should be performed, whenever practicable, through an extraperitoneal incision. The bladder should previously have been rendered as sterile as possible by antiseptic irrigation. A transverse suprapubic incision gives the best exposure. The viscus should be distended with air to facilitate orientation. The neighboring cellular tissue and margin of the incision should be protected by gauze pads.

Single pedunculated tumors should be surrounded with gauze, the pedicle crushed with forceps, and divided with the cautery knife. When the growth is sessile, an attempt should be made to evert the area of the bladder, which is the seat of the growth through the vesical incision. The diseased part should then be excised together with a portion of the surrounding healthy area. When it is evident that the growth is malignant, the entire thickness of the bladder wall should be taken, the line of excision being made at a considerable distance from the infiltrated margins.

When a ureteral orifice lies directly in the path of excision, the ureter should be catheterized, dissected free, and the diseased part excised, and the healthy extremity reimplanted in an uninvolved area.

BIBLIOGRAPHY

- BEER, EDWIN: "The Surgical Therapy of Benign and Malignant Tumors of the Urinary Bladder." J. A. M. A., 1917, lxxviii, 680.
 BUERGER, LEO: "The Pathological Diagnosis of Tumors of the Bladder, with Particular Reference to Papilloma and Carcinoma." S., G. and O., 1915, No. 2, xxi, 179.
 CASPER: "Zur Pathologie u. Therapie der Blasentuberculose." Monats. f. Urologie, 1900, Bd. v, S. 499.
 DUDLEY: "Incontinence of Urine in Women." J. A. M. A., June 3, 1905.
 GERAGHTY, J. T.: "Fulguration in the Treatment of Bladder Tumors." S., G. and O., 1915, No. 2, xxi, 150; *Ibid.*: "The Results of Treatment of Bladder Tumors." J. A. M. A., 1917, lxxix, 1336; *Ibid.*: "Treatment of Bladder Tumors." N. Y. Med. Jour., 1916, civ, 838.

- HUNNER, G. L.: "Ureterovesical Anastomosis—An Improved Method; Report of Two Cases." Amer. Gynecology, December, 1902; *Ibid.*: "A Rare type of Bladder Ulcer in Women; Report of Cases," Boston Med. and Sur. Jour., 1915, clxxii, 660; *Ibid.*: "Elusive Ulcer of the Bladder. Further Notes on a Rare Type of Bladder Ulcer, with a Report of Twenty-five Cases." Trans. Am. Gyn. Soc., 1918, xliii, 27-63.
- KEENE AND LAIRD: "The Diagnosis of Tuberculosis of the Kidney." Amer. Jour. Med. Sci., September, 1913, No. 3.
- MEYER, W.: "Early Diagnosis and Early Nephrectomy for Tuberculosis of the Kidney." Med. News, May 1, 1897.
- ROVSING, T.: Die Blasenentzündungen, ihre Aetiologie, Pathogenese, und Behandlung. Berlin, 1900.
- UHLE AND MACKINNEY: "High-Frequency Destruction of Tumors of the Bladder." Penna. Med. Jour., March, 1916, 423.

CHAPTER XXIV

URINARY FISTULA

THE most common site of a urinary fistula is between the bladder and the vagina; this is known as a *vesicovaginal fistula* (Fig. 404). Fistulous communication may take place between other parts, such as the urethra and the vagina (*urethrovaginal*) (Fig. 405), the bladder and the cervix (*vesicocervical*) (Fig. 406), and between the ureter and the vagina (*uretero-vaginal*) (Figs. 408 and 409).

Etiology.—Fistulæ involving the urinary tract may be produced in several ways. Probably the most common cause of fistula is necrosis following dystocia, in which a part of the urinary apparatus has been caught between

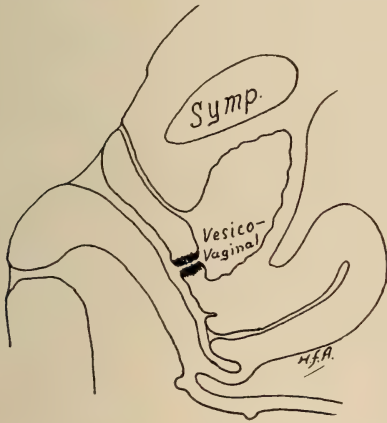


FIG. 404.—Vesicovaginal fistula—result of trauma of labor or operation.

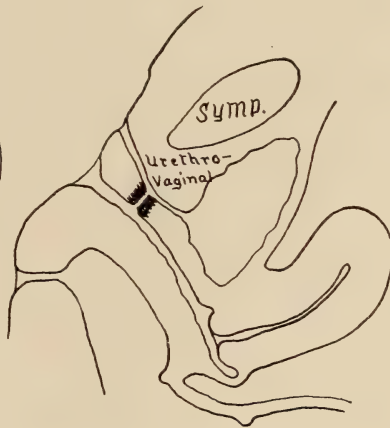


FIG. 405.—Urethrovaginal fistula—result of trauma of labor or operation.

the foetal head and the unyielding pelvic bones, and so compressed that necrosis of the affected part has subsequently occurred. The most common fistula due to this cause is the vesicovaginal.

Fistula may be the result of injury to the bladder or ureters after certain operative procedures, such as panhysterectomy for carcinoma. Operations for the cure of cystocele or uterine prolapse, as well as certain surgical obstetric procedures, such as vaginal Cæsarean section or pubiotomy, may occasionally be causative factors. Fistulæ also occur in cases of advanced carcinoma of the cervix, or as the result of syphilitic or tuberculous ulceration, or of ulceration produced by a foreign body, such as a pessary.

Symptoms.—A urinary fistula following a difficult labor usually manifests itself at some time during the puerperium, being preceded by febrile

disturbance, vaginal discharge, and hæmaturia. The early symptoms are due to a necrosis of the devitalized tissue, and when the slough has separated, the incontinence becomes manifest. Ureteral fistulæ following hysterectomy usually make their appearance within two to three weeks after operation.

The urinary incontinence of vesical fistula varies in degree with the size

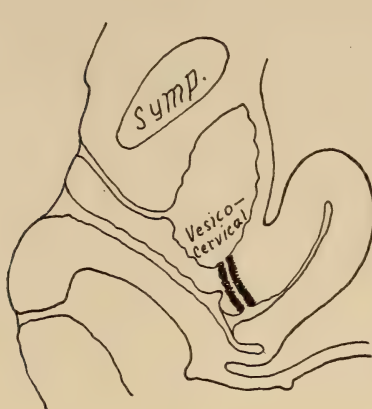


FIG. 406.—Vesicocervical fistula—result of trauma of labor, operation or carcinomatous ulceration.



FIG. 407.—Rectovaginal fistula—result of trauma of labor, operation or syphilitic ulceration.

FIG. 408

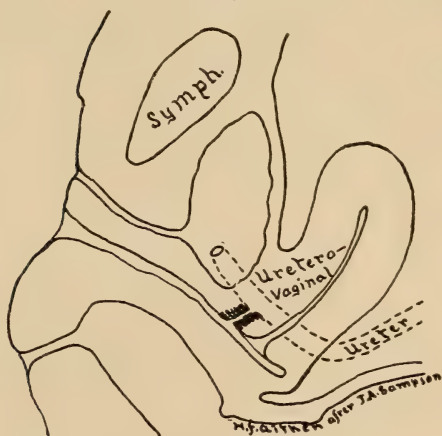
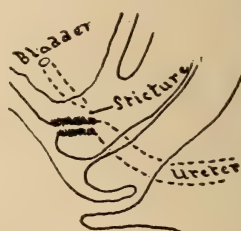


FIG. 409



FIGS. 408 AND 409.—Ureterovaginal fistula—result of trauma of labor or operation.

and the site of the fistula and with the posture of the patient. The incontinence of a ureteral fistula is constant and not dependent on the position of the patient. The dribbling from a vesical fistula may be constant if the fistulous opening is large and if it is situated at the trigone; or it may be apparent only after distention of the bladder has taken place, or, when the fistulous opening is small and the opening is high up near the cervix, only in the reclining posture.

As a result of the incontinence there is maceration of the tissues about the fistulous opening, and a deposit of urinary salts upon the vaginal walls and the external genitalia. There may also be excoriation of the external genitalia and of the inner surface of the thighs. Beneath the incrustation of urinary salts ulceration of the mucous membrane may take place. The urine often undergoes ammoniacal decomposition and gives off a foul odor. Emaciation, depression of spirits, and general ill health may occur.

Ureteral fistulæ are less likely persistently to discharge urine in considerable amount than are vesical fistulæ. As a rule, the dribbling of urine gradually grows less, and sooner or later it is markedly diminished, either from spontaneous closure or because there is sufficient contraction of the fistulous opening to obstruct the ureter, reduce the excretory activity of the affected kidney, and produce a hydronephrosis. About 50 per cent. of post-operative ureteral fistulæ close spontaneously in from four to six weeks. In most of those that do not close spontaneously, stenosis of the ureter, hydronephrosis, pyelitis, and pyelonephritis take place. It is also usually evident that the site of the fistula is the ureter, owing to the fact that the bladder becomes filled with normal urine from the uninjured ureter, and is emptied at regular intervals, whereas in the case of vesical fistulæ very little or no urine may be passed through the urethra.

Diagnosis.—The diagnosis of a urinary fistula can usually be formulated from the symptoms, although a functional incontinence of urine may be mistaken by the patient for the evidence of a fistula. Examination is important chiefly for determining the exact site and position of the fistula; this is not always easy. The difficulty in locating the position may be due to several causes. If the laceration or necrosis of tissue that produced the fistula is extensive, there may be considerable scar tissue in the vagina or about the vaginal vault, making exposure of the parts difficult.

The incrustations of urinary salts and the tenderness incident to a low-grade inflammation of the mucous membrane may render any manipulation painful and difficult. In simple cases the fistulous opening may be located by means of a probe introduced through the vagina or the bladder. The site of the fistula may also be indicated by filling the bladder with a colored solution, such as methylene-blue, or with sterile milk, and exposing the anterior vaginal wall to view. The exact position of the vesical fistula and the condition of the bladder mucosa may also be ascertained by cystoscopic examination, the patient being placed of necessity in the Sims' or the knee-chest position in order to secure atmospheric distention.

In cases of ureteral fistula that do not involve the vesical part of the ureter, the fluid injected into the bladder will not escape, and the urinary excretion from the sound side, obtained by catheterizing the bladder, may show no abnormal constituent.

In cases of ureteral fistula cystoscopic examination will show the interior of the bladder to be uninvolved; inspection of the orifice of the affected ureter will fail to disclose the periodic retraction and discharge of urine, and a catheter introduced into the affected ureter will usually meet with obstruction before it has passed very far. As a rule, it is possible to

pass a ureteral catheter through the vaginal opening of the fistula into the affected ureter, and possibly into the pelvis of the corresponding kidney. This, combined with an obstruction close to the bladder in the vesical part, will be sufficient ground on which to base the diagnosis.

Treatment.—The treatment of vesical fistula is usually operative. In early cases, when the fistulous opening is small, a spontaneous cure may be looked for and encouraged by draining the bladder with a self-retaining catheter, and touching the edges of the fistulous opening with silver nitrate. Most cases, however, will require some form of operative procedure. In these the patient should be prepared for operation by treatment directed to rendering the operative area as nearly normal and free from infection as possible. To this end the patient should be instructed to drink water freely. The diet should be bland, and a urinary antiseptic should be prescribed. For this purpose a combination of sodium benzoate and hexamethylenamine, 5 grains of each four times a day, will usually be satisfactory. The incrustations may be removed with warm alkaline solutions, and the irritated mucous membranes touched with silver nitrate and protected with a thick ointment. After this preparatory treatment, which will succeed in removing urinary incrustations and in relieving inflammation of the vesical mucous membrane and of the vaginal mucosa, an operation for closure of the fistula may be undertaken. The success and ease of performance of the operation will depend upon the size and the position of the fistulous opening and upon its accessibility.

The typical operation for vesicovaginal fistula consists of making a boat-shaped denudation about the fistulous opening, upon the anterior vaginal wall, the margins of the denudation sloping from the vagina toward the bladder. The denuded area is then approximated by means of sutures that are passed down to, but that do not include, the vesical mucous membrane. It is usually preferable to make the denudation in the long axis of the vagina, so that the sutures may be passed and tied in a transverse direction, thus causing less traction upon the cervix, and lessening the tendency to shorten the anterior vaginal wall. The direction of the denudation will, however, depend somewhat upon the conditions of the individual case, and, as a general rule, the denudation should be made in that position in which coaptation of the denuded margins will cause the least traction.

Fistulous openings high in the vagina, and especially those following hysterectomy, may be difficult to expose and to treat in the manner just described. In such cases it will be advisable, as advocated by Ward, to free the bladder wall, as far as possible, from its surrounding attachments to the broad ligament, the cervical stump, or the vaginal fornix; draw it into the incision, and prepare the vesical opening separately from the vaginal opening.

The vaginal wall is divided by a longitudinal incision that passes directly through the fistulous opening and extends for an equal distance in front of and in back of that point. If the incision alone does not permit of sufficient mobilization of the bladder, a second transverse incision, bisecting the first at the fistulous opening, is made.

In closing the fistula the vesical and the vaginal sutures should pref-

erably be placed in different sagittal planes, *i.e.*, they should not be in apposition (Fig. 410). When the vesical injury is close to the ureteral area, so that in passing the sutures there is danger of injuring or obstructing the vesical portion of the ureter, it will be advantageous at times to make an incision into the bladder, of sufficient length to expose the ureteral orifices, and then to place catheters in these orifices while the sutures are being passed.

Ureterovaginal fistula may be treated by operation from below (vaginal), operation from above (extraperitoneal laparotomy), or by removal of the affected kidney.

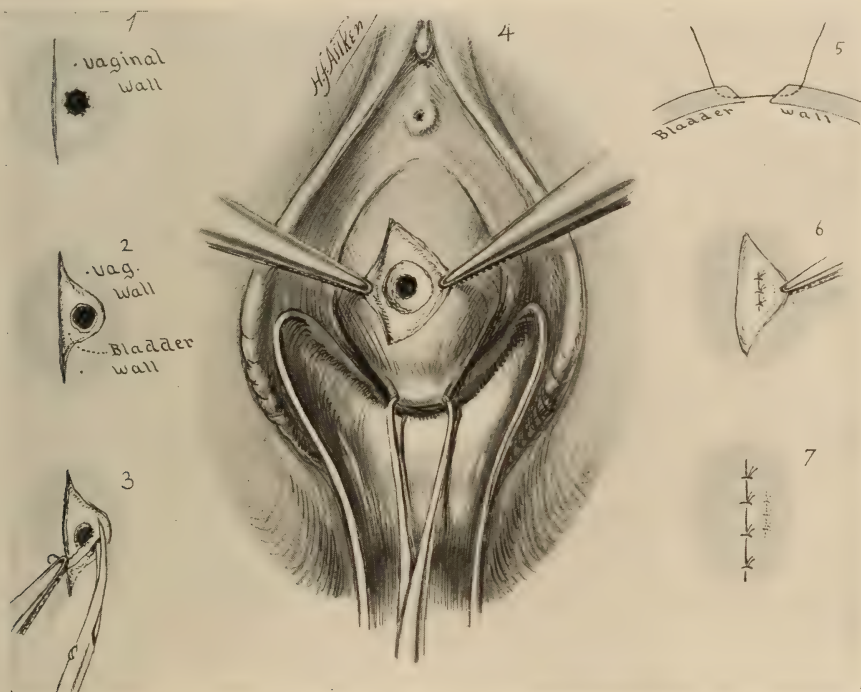


FIG. 410.—General scheme of operation in vesicovaginal fistula: 1, incision to one side of fistulous opening; 2, excision of vaginal wall about fistulous orifice; 3, denudation of fistulous opening in the bladder wall and separation of vaginal flaps from bladder wall; 4, parts denuded, ready for suture; 5, scheme of suture of bladder opening; 6, bladder opening sutured; 7, suture of vaginal incision completed and relation of suture line to suture line of the vesical orifice.

1. *Vaginal Operation.*—The vaginal route is applicable to fistulæ situated near the bladder. The vaginal mucosa is divided over a line that corresponds to the position of the ureter within the bladder wall. The vaginal wall is then separated, on each side of the incision, from the bladder and the ureter, a catheter is inserted into the fistulous opening, and the lower end of the upper segment of the ureter is dissected free. The freed lower end is turned into a small opening made in the bladder wall at an adjacent convenient point, and anchored with sutures, the butt-end of the catheter having previously been passed into the bladder through the anastomotic opening and brought out through the urethra. The divided vaginal mucosa is now brought together over the operative area and secured with separate sutures. The ureteral catheter should be left *in situ* for two or three days.

2. *Extraperitoneal Abdominal Operation*.—In this method an incision is made in the semilunar line, directly over the pelvis. The peritoneum is pushed up, and the lower end of the upper ureteral segment is gently freed. An anastomosis with the bladder is now made, the guide to the vesical opening being a pair of closed forceps introduced into the bladder through the urethra. The ureteral end, which has been slit bilaterally for a short distance, is now drawn into the bladder and fixed to the vesical wall with catgut sutures. The muscular wall of the bladder is then united to the ureteral wall with fine linen sutures. The bladder itself is drawn up and attached to the ureter above the anastomosis, so that it partly envelops the lower extremity of the ureter. The downward pull of the bladder should be relieved by releasing the lateral attachments of the bladder and by suturing the organ to the pelvic wall at some convenient point. The wound should be closed with drainage, but great care must be taken that the drain does not come in contact with the area operated on.

Uretero-ureteral anastomosis is not so satisfactory as ureterovesical anastomosis, but in some cases the former may appear to be desirable. In performing this operation the end of the distal ureter is divided in the median line for a distance of half a centimeter. This slightly increases the circumference of the distal opening. The proximal end is now drawn into the distal opening, well beyond its margins, and fixed in position by a traction suture of catgut. The operation is completed by inserting interrupted sutures of catgut uniting the outer walls of the proximal and distal segments at their junction.

Ureterorectal or sigmoidal anastomosis, after the method of Stiles, may be performed as follows: The proximal end of the ureter is implanted into the lowest part of the pelvic colon by traction sutures of catgut that include all the coats of both intestine and ureter. Permanent fixation of the ureter to the intestine is now made by uniting two parallel folds of the intestinal wall over the implanted ureter, from a point three-fourths of an inch below the anastomotic site to one inch above it. For this purpose fine linen sutures are used.

Nephrectomy is the operation of choice when either of the operations just described promises to be especially difficult or has been unsuccessful, and when the opposite kidney is healthy and able to carry on the renal function. Nephrectomy is indicated also when there is evidence of hydro-nephrosis or pyelonephritis on the affected side, and when the opposite kidney is healthy.

BIBLIOGRAPHY

- EMMETT: *Vesicovaginal Fistula*, etc. New York, 1868.
 KELLY: "The Treatment of Vesicovaginal and Rectovaginal Fistulæ High up in the Vagina." *J. H. H. Bulletin*, 1902, vol. xiii.
 LAMBALLE, JOBERT DE: *Traité des Fistules Vesico-Uterines, Vesico-Utero-Vaginales*, etc. Paris, 1852.
 SIMON: *Über die Heilung der Blasenscheiden-Fisteln*. Giessen, 1854.
 SIMS, J. M.: "On the Treatment of Vesicovaginal Fistula." *Amer. Jour. Med. Sci.*, 1852, xxiii, 59.
 STILES, H. J.: "Epispadias in the Female, and Its Surgical Treatment." *Surg., Gynec. and Obst.*, 1911, xiii, 127.
 WARD, G. G.: "The Operative Treatment of Inaccessible Vesicovaginal Fistulæ." *S., G. and O.*, 1917, No. 2, xxv, 126.

CHAPTER XXV

DISEASES OF THE KIDNEY AND URETER

THE diseases of the kidney that are of particular interest to the gynecologist are ptosis, hydronephrosis, pyelonephritis, tuberculosis, calculus, and tumor.

PTOSIS (ABNORMALLY MOVABLE KIDNEY)

Etiology and Pathology.—The kidney is considered to be abnormally movable when it can be brought entirely below the costal margin. Ptosis is seen in about 25 per cent. of women.¹ Movable kidney is favored by congenital defects in the kidney fascia and the kidney fossæ, and by the diminution of intra-abdominal pressure incident to relaxation of the abdominal wall following pregnancy. Ptosis may also be produced by the wearing of improper corsets, with constriction at the waist, and possibly, under predisposing conditions, by trauma. Movable kidney is often found in thin women with long waists, who manifest a tendency to a general ptosis of the abdominal viscera; in these cases the renal fascia is poorly developed and the kidney fossa is shallow.

Symptoms.—An abnormally movable kidney may give rise to no symptoms. When symptoms are present, they are occasioned by kinking of the ureter, torsion of the renal vessels, and traction upon the duodenum. Acute attacks of pain (Dietl's crisis) may occur when the ureter is kinked as the result of obstruction of the ureteral lumen and distention of the renal pelvis by the urine that is dammed up behind the seat of obstruction. Intense congestion of the entire kidney, caused by torsion and obstruction of the renal vessels in the kidney pedicle, may also give rise to acute attacks of pain. The less severe symptoms of abnormal mobility are: A sensation of weight or of dragging after prolonged standing or walking; digestive disturbances, due to traction of the displaced kidney upon the intestine.

Diagnosis.—The diagnosis of movable kidney is easily made. The directions for palpation of the kidney have been given elsewhere (page 138). By conjoint manipulation the kidney can readily be palpated, its shape and size noted, its ready displacement upward beneath the margin of the ribs observed, as well as a return to its former location when the examiner's hands no longer support it.

Movable kidney does not call for treatment so long as it is not giving rise to positive and actual symptoms. When attacks of kidney colic occur, there is usually a kink of the ureter, and this can be demonstrated, if deemed desirable, by pyelography, the picture being taken with the patient in the erect or nearly erect posture. When the movable kidney is believed to be the cause of digestive disturbances or of a dragging or heavy sensation upon standing or walking, the actual part of the kidney in the production of these

¹ The right kidney is more frequently abnormally movable than the left; both kidneys are more often movable than the left kidney alone; in but 7.5 per cent. of cases of abnormally movable kidney is the left side only involved.

symptoms may be ascertained by supporting the organ with a pad. Great care should, however, be taken to differentiate symptoms actually due to the kidney itself from those resulting from a general tendency to visceroptosis.

Treatment.—The treatment of nephroptosis consists in the wearing of a suitable corset or pad or in operative procedure. A well-constructed corset with a pad so placed as to exert pressure on the abdominal wall beneath the kidney area may result in relief of symptoms, and if the patient takes on fat, may be curative. As a rule, abnormally movable kidneys that give rise to repeated acute attacks of pain require the operation of nephropexy for their relief.

HYDRONEPHROSIS

Etiology and Pathology.—Hydronephrosis, or the accumulation of urine in the pelvis of the kidney, may be congenital or acquired. The immediate cause of the congenital variety may be complete or partial stricture of the ureter; malformations of the ureterovesical or the ureteropelvic junction; kinks or twists in the course of the ureter; a too oblique or too high insertion of the ureter into the kidney pelvis; kinking of the ureter over anomalous kidney vessels; congenital displacement or congenital tumors of the ureter, bladder, or adjacent organs.

The acquired form of hydronephrosis may be the result of trauma to the kidney pelvis or the ureter, with subsequent displacement, adhesions, distortion, or cicatricial contraction. Compression of the ureter by pelvic tumors or infiltrations, stricture of the ureter following inflammatory lesions, renal or ureteral calculi, in short, any form of obstruction that develops slowly but continuously may produce a hydronephrosis.

The most common form of hydronephrosis seen in women is that which is intimately related to floating kidney. Pyelitis also may lead to hydronephrosis, for when the mucous membrane of the ureter and kidney pelvis becomes swollen, a tendency to valve formation frequently develops, the mucosa of the kidney pelvis becoming displaced downward and invaginating itself into the narrow ureteral orifice. As the hydronephrosis develops and the resulting cyst becomes larger, the kidney pelvis becomes so distorted as further to increase the obstruction to the outflow of urine through the ureter. After distention of the kidney pelvis has reached a certain stage the calyces of the kidney begin to distend, and finally the medulla and the cortex are thinned and stretched, and the kidney takes on the form of an irregular cystic tumor in whose walls may be found the remnants of the original kidney tissue.

Symptoms.—Up to a certain point in the development of hydronephrosis the accumulation of urine is intermittent, being interrupted by periods of relief; that is, the patient will suffer at repeated intervals from attacks of renal colic, followed by an increased discharge of urine as the pain subsides. Between the attacks the symptoms may be *nil*, or there may be a feeling of constant distress, fullness, tension, or soreness on the affected side. In severe cases, during the period of distention, a well-marked enlargement may readily be detected in the kidney region. If, however, the examination is made at a time when the distention has been relieved and the walls of the hydronephrotic sac are flaccid, no enlargement may be apparent on palpa-

tion. It is in these cases that pyelography proves a very valuable aid to diagnosis. If the ureter of the affected side is catheterized and the pelvis injected with sodium bromide, thorium nitrate, or collargol, the outline of the kidney may be determined with absolute certainty. These patients usually take a large amount of the injection fluid before complaining of pain, as much as 30 to 40 c.c. being injected in some cases.

Diagnosis.—The differential diagnosis between hydronephrosis, cystic distention of the gall-bladder, and cystic tumors of the ovary and intestine has been much simplified by pyelography. The enlarged mass also will present the characteristic features of kidney enlargements. (See pages 135 and 138.)

Treatment.—In the early stage the treatment consists in removing the source of the obstruction. When the case is advanced and the kidney parenchyma is atrophied, extirpation may be considered if the opposite kidney is healthy and is already bearing the bulk of the excretory function. Removal of the obstruction may require various procedures and operations, such as excision of pelvic tumors, dilatation of a constricted ureter, removal of ureteral calculi, suspension of a ptosed kidney, etc. Local treatment of pyelitis and plastic operations for the removal of valve-like formations in the kidney pelvis and the ureter may also be required. When the kidney substance itself forms part of the wall of the hydronephrotic sac, or if the distention of the kidney pelvis itself has reached such a degree that there is a valve-like formation between the kidney pelvis and the ureter, a nephrectomy is often advisable. Plastic operations on the kidney pelvis designed to correct abnormal relations between the kidney pelvis and the ureter, although occasionally brilliant successes, in the majority of cases simply put off the day when nephrectomy must be performed.

PYELONEPHRITIS, PYELONEPHROSIS, EMPYEMA OF THE KIDNEY PELVIS, AND KIDNEY ABSCESS

Etiology and Pathology.—Infections may reach the kidney through the blood, by way of the urinary passages, or from neighboring organs. Recent observations have shown that the hæmatogenous form of infection is the most frequent. *Hæmatogenous* infection is possible whenever bacteriæmia is present, and occurs in such diseases as pneumonia, typhoid fever, diphtheria, osteomyelitis, puerperal sepsis, erysipelas, phlegmons, furuncles, infected wounds, etc. The streptococcus is the organism most often concerned in this form of infection, but the staphylococcus, the gonococcus, the pneumococcus, and the bacillus typhosus may also cause hæmatogenous infection of the kidney. *Infection from the urinary passages* occurs usually by extension from the bladder along the mucous membrane of the ureter, or through the peri-ureteral lymphatics to the kidney pelvis; it may also be carried through the lymphatics and the veins from various septic areas along the course of the ureter. In ascending infections the colon bacillus plays a very prominent part, and the proteus vulgaris is not infrequently found. The gonococcus is not, as a rule, a source of infection of the upper urinary passages. Its chief rôle undoubtedly consists in the alterations it produces in the lower urinary passages, notably stricture and partial obstruction of the urinary outflow. The stagnation of urine favors the development and

growth of other organisms. All kidney infections are aggravated by obstruction to the excretion of urine.

Cabot and Crabtree assert that the coccal infections of the kidney affect the cortical portion and produce the lesions that have generally been regarded as indicative of a hæmatogenous infection; the colon-typhoid group of organisms, on the other hand, produce their changes in the kidney pelvis and neighboring tubules—the lesions generally regarded as significant of an ascending infection.

The diseases of neighboring organs that may extend to the kidney are appendicitis, caries of the vertebræ, and abscess of the liver or the spleen.

Hæmatogenous pyelonephritis may affect both sides. In the severest forms death may occur before many alterations take place in the kidney. Marked hemorrhages may occur throughout the kidney, or minute abscesses may develop. Finally, the entire kidney may be honeycombed with abscesses, the pus eventually finding its way into the kidney pelvis, and resulting in pyelitis and obstruction of the ureter. The streptococcus and the staphylococcus, or other so-called pus cocci, are usually the infecting agents. In the form due to the colon bacillus, and generally regarded as secondary to infection of the bladder and ureter, ureteritis and pyelitis are the first symptoms observed, followed by involvement of the medullary part of the kidney. The path of the infection is shown by red stripes running from the pelvis to the capsule, along which rows of abscesses quickly develop. Many cases of so-called ascending infection are in reality instances of hæmatogenous infection with the colon bacillus.

Stagnation of the urine and dilatation of the kidney pelvis increase the urinary tension within the kidney and favor the coalescence of abscess cavities with one another and with the kidney pelvis, so that finally the organ becomes transformed into a large abscess sac, with but very little kidney tissue remaining.

Symptoms.—The symptoms of an acute hæmatogenous suppuration (usually streptococcus, staphylococcus, or pus cocci) may be entirely general, with no indications pointing to localized infection. This is true in those cases that rapidly prove fatal. When the infection is less virulent, there may be acute pain in the loins, with scanty or no urine. The urinary findings that are most suggestive are granular casts, blood, and albumin. Bacteria will be found only in the earlier stages, and pus is not found, as a rule. In the earlier stages the phthalein test is negative or nearly so. The kidney region may be sensitive from the first, but no demonstrable enlargement may be manifest until later. The early general symptoms are those indicative of sepsis elsewhere, such as high temperature, chills, etc. Later, when suppuration is established, the fever becomes remittent, and as the case progresses uræmia supervenes. Leucocytosis is present throughout the infection, varying in accordance with the severity and the resistance of the individual.

The symptoms of colon-bacillus hæmatogenous infections of the kidney and of the ascending forms of pyelonephritis are less sudden in onset and in general less serious. Usually a history of previous lesion in the lower tract may be elicited. Whatever the nature of this previous illness was, it must have been followed by some obstruction in the ureter, bladder, or

urethra. Often a bacteriuria has existed for some time, the patient having observed that the urine has a disagreeable odor. Ascending pyelonephritis may be precipitated by instrumentation. Pain develops along the course of the ureter of the affected side, gradually extends to the loin, and becomes more severe and constant. As the disease progresses fever, leucocytosis, enlargement and tenderness of the kidney, and anæmia develop, and bacteria and pus are present in the urine, which is very often alkaline. The phthalein test shows a diminution of function. The pain increases periodically, and is followed by a profuse discharge of pus from the ureter, after which the symptoms subside until pus reaccumulates within the kidney.

Treatment.—The treatment varies with the severity of the affection. In the severest form dry cups and ice may be used in the early stage. As a rule, as soon as the organ becomes palpably enlarged and the evidences of suppuration are definitely established, nephrotomy should be performed and drainage established. The general condition should receive treatment at the same time, and an effort should be made to remove the primary focus of infection.

In the milder (colon-bacillus), so-called ascending form, when only one kidney is involved, the indications are to relieve any obstruction that may be present in the lower part of the urinary tract, and, second, to increase the amount of urine secreted and render it as bland as possible. With these points in mind, a stone blocking the ureter, a stricture, or a violent cystitis should be exposed to active treatment, and urinary antiseptics and diluents prescribed.

When the symptoms point to a beginning suppurative lesion of the kidney substance itself, immediate operation should be advised. After exposing the kidney, if it seems probable that the infection is confined entirely to the pelvis, its posterior wall should be incised and the edges sutured to the border of the lumbar wound, so as to provide sufficient drainage. If the suppuration has extended to the medulla or to the cortex of the kidney, a nephrotomy incision should be made along Brodel's white line, and the pelvis and calyces exposed to examination. If the kidney is destroyed entirely or nearly so, and the other kidney is in good condition, nephrectomy should be performed.

TUBERCULOSIS OF THE KIDNEY

Etiology and Pathology.—Tuberculosis of the kidney is almost invariably secondary to tuberculosis elsewhere in the body. In a considerable proportion of cases, however, the primary focus cannot be demonstrated clinically. One case of tuberculosis of the kidney in which, at autopsy, no other tuberculous lesion could be found anywhere in the body, has been reported by Stewart and Kelly. Tuberculosis of the kidney may occur as a part of an acute miliary tubercular process, in which case it is usually bilateral, and occurs most frequently in children. This form of infection is of no surgical interest, and need not be considered here. The form of tuberculosis of the kidney or tuberculous disease of the kidney which is amenable to surgical treatment is known as the caseocavernous variety. With few exceptions the route of infection is through the blood. Extension from

neighboring tuberculous foci has been reported, and an ascending form of infection from the bladder has also been encountered. Trauma to or any disease that lowers the resistance of the kidney may predispose the organ to tubercular infection.

Although it may occur in early life, caseocavernous tuberculosis of the kidney is usually encountered in adults, the average age being thirty-two and a half years. The disease is generally unilateral at first, and remains so for a long time, especially in those patients who are not suffering from



FIG. 411.—Tuberculosis of the kidney, upper half diseased. First symptoms four years before removal. (Stetson Hospital).

active tuberculous lesions elsewhere. According to Israel, with whom Kelly agrees, 90 per cent. of the cases that reach the surgeon are unilateral.

The disease usually begins in the glomeruli, near the medulla, where tubercles, surrounded by marked round-cell infiltration, make their appearance. A number of these areas may coalesce, forming nodules that undergo caseation and softening in the center, and appear as grayish-white or yellowish-gray masses. These may remain discrete and scattered throughout the cortex and medulla, or a number of them may coalesce, forming cavities of greater or lesser size (Fig. 411). With this cavity formation there may be degeneration of the neighboring parenchymatous kidney cells, and the substitution of fibrous tissue. If the pelvis of the

kidney has not been invaded and the ureter is patulous, the kidney may not be enlarged. The organ is usually irregularly lobulated, some of the lobules being hard, and others soft.

Sooner or later some of the caseous cavities open into the kidney pelvis and involvement of the ureter then takes place. This is manifested by the formation of tubercles in the mucosa, with caseation and ulceration, and marked infiltration and thickening of the muscular wall. Stricture of the ureter may result, or the lumen may become plugged with caseous matter. Obstruction of the ureter may lead to an increase in the kidney lesion, with the formation of larger cavities and destruction of the remaining parenchyma. If secondary infection occurs, the process may be intensified, suppuration may take place, and the kidney be transformed into a huge multilocular abscess sac. Perirenal abscess is especially likely to follow secondary infection.

Symptoms.—As a rule, the earliest manifestation is increased frequency of urination. This may occur even before any recognizable changes in the bladder or ureteral orifice take place, which may be explained on the ground of a reflex pain or an irritating toxin in the urine. When, later, the bladder is involved, there is increased frequency of urination, the desire to urinate becomes intense and even uncontrollable, and the act is associated with pain. The severity of the bladder symptoms corresponds in the main to the extent of the vesical involvement, but many exceptions occur. Increased frequency of urination without recognizable pelvic lesions, without alterations in the bladder that are detectable by the cystoscope, and with no abnormal constituent in the urine, is always at least *suggestive* of early renal tuberculosis. Sooner or later pus and blood make their appearance in the urine, varying in amount according to the location of the kidney lesion and the patency of the ureter. The attention of the patient is drawn to the urinary abnormality by turbidity in the case of pus, or by the change in color in the case of blood.

If the tuberculous focus does not communicate with the kidney pelvis or the ureter is blocked there may be little pus. The amount of pus may suddenly increase if a focus bursts into the pelvis or a ureteral obstruction is removed. Hæmaturia is most pronounced when the tuberculous focus affects principally the papillæ.

The first symptom of renal tuberculosis may consist of hæmaturia or an attack of renal colic. In two-thirds of the cases there is a certain amount of distress in the kidney; usually this is merely a fairly constant feeling of pressure or a dull ache, but occasionally there are paroxysmal attacks of renal colic. The colic is due either to inflammatory swelling of the mucosa of the ureter obstructing the urinary outflow, or to the attempted passage of tuberculous detritus, blood-clots, etc.

In the later stages, when pyonephrosis or perirenal abscess is present, the local pain and tenderness are usually well marked and unmistakable.

The general symptoms of renal tuberculosis, like all the others, depend on the exact location and extent of the disease and the associated conditions. In early or moderately advanced cases there may be no more than a slight evening rise of temperature, with malaise and anæmia. In advanced cases, when the ureter is blocked and pyonephrosis or perinephritis or both are

present, there may be high fever, exhausting sweats, and rapid emaciation. Between these two extremes there are many variations. So long as there is no secondary infection, leucocytosis is usually absent.

In the early stages the kidney is, as a rule, slightly enlarged, but this enlargement can be recognized by palpation in less than half of the cases. It is more frequently recognized when the right kidney is affected than when the left is the seat of disease. If the ureter is blocked and there is more than the usual increase in size, or if secondary infection and pyonephrosis or perinephritis are present, the kidney is generally palpably enlarged. There is often some tenderness in the costovertebral angle, especially if perinephritis is present. It must be remembered that the unaffected kidney may be larger than the diseased organ, owing to compensatory hypertrophy.

The urine usually contains pus and blood, the amount varying according to the location of the tuberculous foci, the patency of the ureter, and the vesical alterations. The pus from a tuberculous kidney is grayish and granular, and gives to the urine a ground-glass appearance in contrast to the soft, yellowish appearance given by the pus in other conditions (Keene and Laird).

The reaction of the urine is persistently acid. In the absence of mixed infection no bacteria may be found by smear or culture. Tubercle bacilli may be found in the urinary sediment by staining, but they cannot be absolutely differentiated from the other acid-fast organisms by microscopic examination. The presence of tubercle bacilli in the urine must be confirmed by animal inoculation (see page III).

The tuberculous ureter may be tender along its entire course, but the enlargement is usually difficult to demonstrate, except in its lower part, where it passes through the parametrium at its point of entrance into the bladder. Upon simple digital examination per vaginam the affected ureter may be felt as a tender, rigid cord, about the thickness of a lead-pencil, running from the trigone outward under the vaginal wall, to the side of the cervix, where it is lost in the broad ligament. By bimanual palpation with one finger in the rectum the course of the ureter may be followed out to the pelvic wall. Any abnormality may be emphasized by comparing it with the ureter of the opposite side. Pressure upon the ureter often gives rise to an intense desire to urinate.

The cystoscopic examination is possibly the most important of any single method of diagnosing tuberculosis of the kidney. The cystoscopic findings have been described under the head of Tuberculous Cystitis, page 457.

Diagnosis.—The diagnosis of renal tuberculosis should be based on the results of a combined clinical and laboratory examination. Cystoscopic examination is the most valuable single diagnostic aid, and in a majority of cases forms the basis from which conclusions are to be drawn. The appearance of the bladder may be more or less characteristic. The ureteral orifices may at once indicate the particular kidney affected. It now remains only to catheterize the suspected side and collect a specimen for guinea-pig inoculation. If the laboratory examination yields a positive result, an injection of indigo-carmin should be given in order to determine the relative activity of the two kidneys. The phenolsulphonephthalein test should also be em-

ployed to determine the total renal efficiency. Catheterization of the apparently normal side should be avoided if the diseased kidney is failing to excrete and the indigo-carmin and phenolsulphonephthalein tests indicate that the other organ is maintaining alone a normal renal excretory function. Otherwise a catheter may be passed a few centimeters into the ureter of the sound side, in order to exclude, so far as possible, any involvement.

Enlargement and tenderness of the lower part of the ureter are not diagnostic of tuberculosis, and may be found in ureteral stone or in stricture at the lower end of the ureter with ureteritis.

A single negative laboratory result, no matter how thoroughly the examination was conducted, does not determine an absolutely negative diagnosis of renal tuberculosis, as the manifestations of this disease are essentially intermittent. Negative results obtained in three successive weekly examinations should, however, have considerable bearing on the diagnosis (Keene and Laird).

Treatment.—A tuberculous kidney should be removed by nephrectomy if the opposite organ is functionally able to meet the increased demands that will be made upon it. That this kidney is in good condition is evident when the diseased side excretes no indigo-carmin, when a dark-blue cloud is ejected from the opposite ureter a few minutes after an intramuscular injection of the coloring matter has been made, and when the total phenolsulphonephthalein output is normal. These findings indicate that the diseased kidney is functionally incompetent, and that its fellow is doing all the work. Under these circumstances the diseased kidney may be removed with the assurance that the remaining organ has already taken over and will continue to carry on the renal function. When the diseased kidney is still excreting, a careful relative estimate should be made of the amount of work each organ is doing. The indigo-carmin may appear on the diseased side much later, and the intensity of the blue color be much lower, than on the healthy side; if, together with such a finding, the phthalein test is normal, one may be sure that the opposite kidney is functionally competent.

When desirable, each kidney may be tested separately by the phenolsulphonephthalein test: As large a ureteral catheter as can be introduced is laid into each ureter, and the injection is made directly into a vein; the urine, as it drops from the ends of the catheters, is received in separate tubes. The time required for excretion is estimated for each side and then the total amount excreted is measured.

It is often impracticable to continue this test for more than thirty minutes, and in some cases even less, so that a comparison of the two sides for the usual duration of the phthalein test cannot be made. But if the total phthalein output and the quickness of the reaction are previously known, a comparison of the two sides, even for two periods of fifteen minutes each, will yield valuable information as to the relative activity of the two kidneys. When tuberculosis of the kidneys is bilateral, operation is contraindicated except in the rarest instances, as, for example, when fever is continuous and is due to a mixed infection in the kidney most involved; when the bladder is being severely irritated by the discharge into it of large quantities of pus from the most affected side; when the more involved side

is so extensively diseased that its removal will have no effect on the renal function (Zuckermandl); or when, although both kidneys are involved, the disease in one is of recent origin and the less involved organ is capable of bearing the entire burden of urinary excretion.

When nephrectomy for tuberculosis is undertaken in the early stage of the disease, no unusual difficulties are encountered. Later, when the perinephritic fat has been affected or the kidney is much increased in size or adherent to neighboring structures, the operation may be attended by difficulties.

Certain points in connection with the operation are worth keeping in mind: First, sufficient exposure must be obtained, either by division or excision of the twelfth rib, or by an anterior transverse incision at right angles to the loin incision—about its middle—the so-called frying-pan incision; second, thorough mobilization of the kidney must be effected before ligating the pedicle; third, double ligation of the pedicle in sections should be performed, preparing the vessels separately, if possible, by dissection of the fat; fourth, the ureter should be divided as low down as practicable without unduly prolonging or increasing the dangers of the operation.

In large pyonephrotic tuberculous kidneys intracapsular nephrectomy is the procedure of choice. This is performed by cutting directly through the capsule and enucleating the kidney from within outwards; occasionally in advanced cases it may come away in pieces. As the separation proceeds and the kidney substance is drawn out of its bed, the pedicle is brought into view and secured with clamps. After the kidney is cut away the pedicle is ligated with catgut.

Removal of the entire ureter is unnecessary, nor should one go to any great amount of trouble to secure a large part of it. As was shown by W. J. Mayo, the only tuberculous ureters that require removal are those in which there is a stricture close to the bladder, which causes more or less retention. In other cases the injection into the ureter of from five to ten minims of 95 per cent. phenol, with secure ligation, is the most satisfactory procedure.

Prognosis.—In the early stage of the disease, when the process is limited to one kidney, permanent recovery may confidently be expected. If there is extensive involvement of the bladder, the primary mortality may reach 5 per cent, and the later mortality 20 per cent. About 60 per cent. are permanently cured, whereas in the remainder abnormal urine and other symptoms persist. The prognosis is better in women than in men.

RENAL CALCULUS

Etiology and Pathology.—Renal calculus occurs most frequently in those between the ages of twenty and fifty. Predisposing factors are a very rich diet, composed largely of nitrogenous food, and the consumption of minimum amounts of water in the dietary. It is directly produced by precipitation of the urinary salts. This precipitation may collect upon foreign bodies in the kidney pelvis, such as a bit of mucus, a shred of necrotic epithelium, detached particles of a new growth, or tuberculous detritus. After the nucleus has been formed the stone increases in size by successive deposits of urinary salts

upon its surface. Kidney stones may be composed of uric acid, urates, oxalates, or phosphates. The configuration of kidney calculi is dependent upon their position and number; at first they are small and oval, but as they increase in size they gradually take the form of the part in which they lie. A large calculus may fill the entire pelvis of the kidney, being branched like a piece of coral, and fitting closely into the calyces. A stone overlying the ureteral orifice may be tunneled, or have a groove on one side, through which the urine gains entrance to the ureter. Kidney calculi are often bilateral.

Symptoms.—The symptoms of kidney calculus are pain in the affected kidney or lower abdominal quadrant, increased by movement, by jolting, and by pressure. If the stone becomes so displaced that it blocks the ureter, renal colic ensues. This consists of a violent paroxysmal pain, radiating along the course of the ureter to the genitalia and the inner surface of the thighs. The suffering in some cases is extreme, so that the patient presents all the appearances of severe shock or collapse. Nausea, retching, and vomiting are common. There is marked vesical tenesmus, the patient straining even after the bladder is emptied, and voiding a few drops of dark-colored or even bloody urine. The abdominal muscles on the affected side are rigid, and the patient assumes various positions in an effort to find one that is comfortable. The attack may last from one to two hours to as many days. It may end as suddenly as it began. Relief is experienced as soon as the obstruction is overcome by the stone passing through the ureter into the bladder, or being displaced from the mouth of the ureter into some other part of the kidney pelvis, or by the urine finding its way around the stone. Renal colic is not peculiar to kidney stone, being nothing more than an indication of great tension within the kidney; it is occasioned also by twisting of the vessels at the hilus or obstruction of the ureter from any cause whatever. The urine in kidney calculus usually contains blood, at times in microscopic amounts only. The amount of blood usually varies from time to time, being more profuse after riding, active exercise, etc. Long and narrow hyaline casts, albumin, and high specific gravity are generally found. If the outflow of urine on the diseased side is completely blocked, nothing abnormal may appear in the urine. The kidney may become infected secondarily, under which conditions the symptoms of a pyelonephritis are added to those of the kidney stone.

Diagnosis.—The diagnosis of renal calculus is made from a consideration of the symptoms plus a Röntgen-ray examination. The latter should be made after suitable preparation of the patient, *i.e.*, thorough evacuation of the intestinal tract with castor oil. Pills should not be taken by the patient for several days before examination. Correct interpretation of the skiagraph is important, as shadows believed to be the result of calculi may be due to calcified lymph-glands, gas, pills or tablets, fecal concretions, especially in the appendix, collections of pus in the kidneys, phleboliths in the pelvic veins, and sesamoids in the tendons arising from the spine of the ischium. In order to confirm the diagnosis of renal calculus two or more Röntgen-ray pictures taken at different times should agree. Stones in the ureter may be differentiated from stones outside by a picture taken after catheterization of the ureter with a shadow (bismuth) catheter or by a stereoscopic picture.

Treatment.—The treatment of kidney stone depends upon its size and position. If it is small, lies near the pelvis of the kidney, and is not giving rise to acute distress, it may be left undisturbed in the hope that it will be expelled spontaneously. The patient should be directed to drink an abundance of water containing as little saline matter as possible (distilled water), and the diet should be restricted in quantity and in its nitrogenous element. During an attack of renal colic the pain should be relieved by a hypodermic injection of morphine and atropin and the local application of heat. In cases in which the symptoms are active and the stone is of considerable size or in such a position that spontaneous cure cannot be expected, operation should be performed at once. The kidney should be exposed, pyelotomy or nephrotomy should be done, and the stone extracted. If the case is clean, the kidney wound may be sutured and drainage omitted. If the kidney is markedly diseased, and it has been determined that the opposite kidney is perfectly healthy and has been assuming the bulk of the renal function, nephrectomy may be done, but the frequency of bilateral involvement in cases of kidney stone must be remembered, and nephrotomy with drainage relied upon, unless it can be demonstrated that the affected organ is useless and its fellow kidney in good condition.

TUMORS OF THE KIDNEY

Tumors of the kidney are not very frequent. The most common variety is hypernephroma. Other forms are papillary cystoma, endothelioma, sarcoma, carcinoma, and adenoma.

The symptoms are hæmaturia, pain, and enlargement of the kidney. Hæmaturia is the most common early symptom, and occurs with or without renal colic. In women the growths very often escape observation until the tumor is of considerable size, and when operation is unlikely to prove curative. Although renal colic does not always occur, there may be a disagreeable sense of pressure in the loin on the affected side. The urine may have the color of fresh blood, and may vary from almost pure blood to a straw-colored serum, or it may be clear and contain coagula. Worm-like clots, 10 cm. long, are significant of coagulation within the ureter. Casts and albumin usually appear sooner or later. Palpation of the kidney may show a smooth, symmetric enlargement of the entire organ, or a nodular enlargement projecting from the anterior surface of the lower pole.

A positive diagnosis at times cannot be arrived at without an exploratory incision. A kidney tumor must be differentiated principally from tuberculosis and renal calculus. This can usually be accomplished by the methods of diagnosis already given for these two conditions. As soon as the diagnosis is made nephrectomy is indicated, provided the opposite kidney is healthy.

Cystic Tumors of the Kidney.—Cystic tumors springing from the outer region of the cortex and bordered by the compressed parenchyma may be found associated with contracted kidney. The symptoms are those of nephritis, pressure, and tumor. Partial nephrectomy is the operation of choice.

Polycystic Disease of the Kidney.—Polycystic disease of the kidney may

be present at birth or appear later in life. In its external appearance the kidney may resemble a bunch of grapes.

The symptoms vary, but usually there are polyuria, intense thirst, slight œdema, and later uræmic indications, combined with the development of a palpable tumor in one or both kidney regions.

The diagnostic points are the frequency of bilateral involvement, the knobby surface and the deficient elimination from each kidney.

The treatment should be medical, and not operative, unless it can be determined absolutely that the disease is unilateral and that the unaffected kidney is functionally competent.

Adenocystoma.—Adenocystoma may be benign or malignant. The benign form resembles the early stage of polycystic disease of the kidney and requires the same treatment. The malignant form presents the same general features of other malignant renal growths. The differential diagnosis can be made only as the result of an exploratory incision.

Echinococcus Cysts.—The kidney is said to be affected in from 5 to 8 per cent. of all cases of hydatid disease. Urinary constituents on which to base a diagnosis are found only when the cyst is evacuated into the kidney pelvis. When this occurs, hooklets and daughter cysts may be found in the urine.

The treatment consists in incision and suture of the sac wall to the lumbar wound. If the situation of the cyst is favorable, resection may be done.

Adrenal Tumors.—Adrenal tumors are exceedingly malignant and cannot be differentiated from kidney tumors except by making an exploratory incision.

Pararenal Tumors.—Pararenal tumors differ from those of the kidney in that they are not associated with alterations of the urine. The prognosis is unfavorable. Operative removal is difficult, but unless this is done they almost invariably prove fatal.

OPERATIVE TECHNIC

Incision.—The kidney may be exposed by various incisions, the choice of which depends upon the operation that is to be performed. For nephropexy, for decapsulation of the kidney, for nephrotomy, and for many nephrectomies an incision running from the twelfth rib to the crest of the ilium, along the outer margin of the erector spinæ, is the most suitable. The fibers of the latissimus dorsi are divided close to its point of coalescence with the fascia of the erector spinæ, but without opening the sheath of the latter. The fibers of the quadratus lumborum muscle are bluntly separated along their course without cutting, or the muscle may preferably be displaced inward. The ileohypogastric nerve is sought for in front of and along the outer margin of the quadratus, and turned to one side. The transversalis fascia is divided, exposing the perirenal fat, which is caught with artery forceps and divided well to the inner and posterior part of the wound, in order to avoid the colon. The separation of the perirenal fat is completed by means of the finger, until the kidney is felt and seen in the depths of the wound. Instead of making a vertical incision, it may be made slightly oblique, running downward and outward toward the anterior-superior spine.

A muscle-splitting incision, which can be increased to almost any extent, is begun to the inner side of the anterior superior spine of the ilium, and is carried backward obliquely toward the tip of the last rib. The fibers of the external oblique and its aponeurosis are separated and retracted, exposing the internal oblique muscle, the muscular fibers of which are split on a line between the ninth costal cartilage and the posterior superior spine of the ilium, in which position they are longer than in front of or behind that line. The fibers of the transversus are split and retracted along with the oblique muscle. A diamond-shaped space is thus formed, at the bottom of which the transverse fascia is seen; this is incised, exposing the perirenal fat, and on pushing through the fat, the kidney is easily reached, whatever the position it may occupy. This incision gives ample room, and, if necessary, the whole hand may be introduced into the circumrenal space. If it becomes necessary to expose the ureter, the incision may be continued ob-

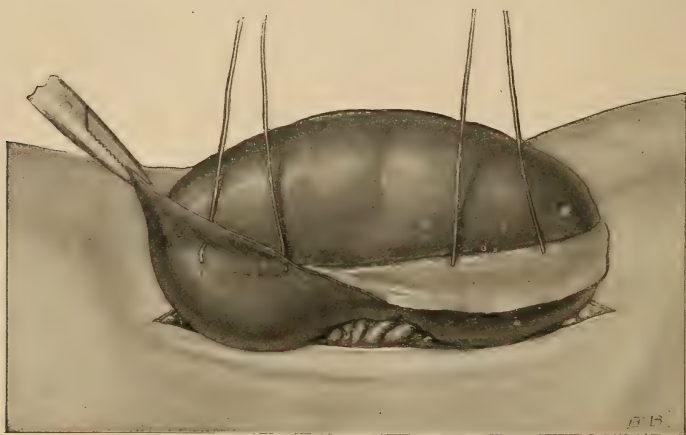


FIG. 412.—Suspension of the kidney by Edebohl's technic. The capsule of the kidney has been reflected and the suspension sutures introduced. (Kelly and Noble's Gynecology and Abdominal Surgery.)

liquely downward toward Poupart's ligament. The internal oblique will then require suturing in order to bring the divided ends together. Preferably a second lower incision through the outer border of the rectus muscle may be made to reach the ureter.

Whether a vertical, an oblique, or a muscle-splitting incision is used, the muscle-fibers should be separated, rather than divided, as far as possible; the ileohypogastric nerve should be located and pushed to one side, and the transversalis fascia should be opened close to the spinal margin of the wound, in order to avoid the peritoneum. After exposing the kidney the organ may be delivered by hooking the finger under the lower pole and lifting it out of the wound by making gentle traction on the fatty capsule.

If it is found that extirpation of the kidney and the ureter is absolutely necessary, the parts may be exposed by an oblique incision beginning at the junction of the erector spinæ with the twelfth rib, running forward and downward to a point two or three fingerbreadths to the median side of the anterior superior spine of the ilium. An incision in this direction has the

advantage of exposing the upper segment of the ureter. The incision may be lengthened downward, on a line parallel with Poupart's ligament.

When the kidney enlargement is extreme, forming an abdominal tumor, a transperitoneal incision may be made. This incision runs along the outer border of the rectus muscle of the affected side, its midpoint corresponding to about the center of the kidney mass. The peritoneum is opened, and the kidney exposed by incising the outer layer of the mesocolon (see Chapter XXXVI).

Nephropexy.—After the kidney has been delivered, the convex border is freed from fat, the capsule proper is nicked over the dorsum of the kidney, a grooved director is thrust between the capsule and the kidney substance, and the former is divided in a straight line from one pole to the other. The capsule is now stripped on both sides half way to the hilum, and sutures are passed through the capsule at four points, puckering the capsule at the point of suture as indicated (Fig. 412). When the capsule has been secured at four points on both surfaces, the kidney is replaced, and the fatty capsule is disposed principally about the lower pole, where it is sutured with fine catgut to the surrounding tissues. The sutures that were previously introduced through the capsule are then passed through the fibers of the quadratus muscle, bringing the raw surface of the kidney directly in apposition with the surfaces of that muscle. The wound is then closed with interrupted sutures of silkworm gut that embrace the entire depth of the wound, care being taken to avoid inclusion of the ileohypogastric nerve.

Nephrotomy.—After exposure and delivery the kidney and accessible part of the ureter should be carefully palpated. On account of the great advancement that has been made in skiagraphy of the kidney and pyelography, nephrotomy is becoming less and less necessary. In doubtful cases, however, in which stone, beginning tumor, or early tuberculosis is suspected, the kidney may be split by an incision through Brodel's white line. The technic of this procedure is indicated in the accompanying illustration (Fig. 413). If the kidney is not infected and no further operative treatment is required, the wound may be closed by through-and-through sutures of catgut introduced by means of a blunt needle. If the kidney is infected, a small drainage-tube may be introduced.

Nephrolithotomy and Pyelotomy.—For these operations the kidney is exposed and delivered in the usual way. The incision for the removal of the stone depends upon the position of the latter. A single stone in the cortex may be removed by making a simple incision directly over it. If the stones lying entirely in the kidney pelvis are small, they may be removed by making an incision through the pelvis that does not involve the kidney sub-

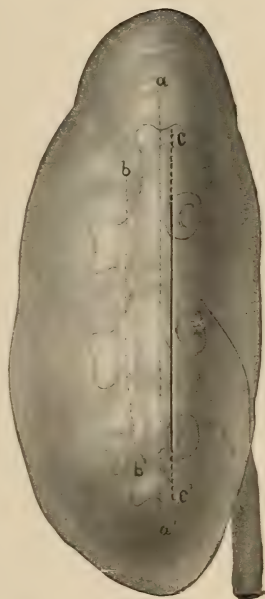


FIG. 413.—Bloodless nephrotomy incision; immediately posterior to the outer convex border. (Kelly and Noble's Gynecology and Abdominal Surgery, W. B. Saunders Co.)

stance. In some cases complete hemisection of the kidney will facilitate the operation and lessen the danger of leaving stones behind. The incision should be made along Brodel's white line. The upper end of the ureter should be palpated rather than sounded for stone, since sounding may cause impaction. In some cases it may be necessary to crush a stone before removal. As a rule, however, they may be removed by the finger, a scoop, a curette, or a pair of slender forceps. Flushing the kidney with a stream of normal salt solution under some pressure is especially valuable when the stone has been fractured, or numerous small stones are present. If the case is clean, and there has been little bruising, the kidney wound may be closed

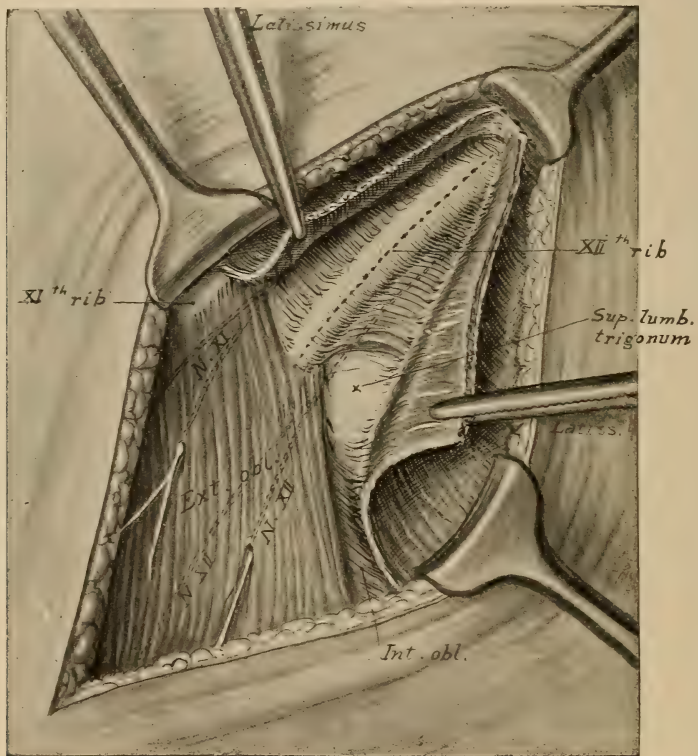


FIG. 414.—Resection of last rib in nephrectomy. (After Cullen, from Kelly and Noble's Gynecology and Abdominal Surgery, W. B. Saunders Co.)

with sutures. Incisions into the renal pelvis should be closed with fine sutures of catgut, comprising only the outer surface. If the case is infected, or the kidney is much damaged, drainage must be employed.

Nephrectomy.—Nephrectomy is performed as follows: After exposure of the kidney in the usual way, it is freed from the surrounding tissues and delivered through the incision. The separation from the surrounding tissues should be continued until the renal artery and vein, as well as the pelvis and ureter, are isolated. A ligature should be passed around the vessels of the pedicle and tied separately, without including the ureter. After the vessels have been divided the ureter should be separated as far down as necessary

and divided between two ligatures, the exposed mucous membrane of the lower end being carefully disinfected with phenol and alcohol. If the kidney is very large, some difficulty may be experienced in effecting its delivery.

A cystic kidney may be reduced in size by aspiration. Delivery of the kidney is sometimes facilitated by introducing the fingers beneath the lower ribs, and forcibly pulling them up; at other times division of the twelfth rib near its vertebral articulation or resection of the twelfth rib simplifies delivery (Fig. 414). If the transperitoneal route is selected for the removal of kidney tumors of large size, resection of the rib will not often be necessary, and exposure and delivery of the kidney will be rendered less difficult.

PYELITIS

Etiology and Pathology.—Pyelitis as seen by the gynecologist occurs as a complication of pregnancy or the puerperium, in the course of development of intrapelvic growths and after operations. It may appear suddenly in the form of acute attack, or slowly as a chronic condition. The latter may be the result of an acute pyelitis or of a moderate but progressive obstruction to the ureter, such as may be observed in prolapse of the uterus with a marked cystocele. As a rule, two causes are responsible for the occurrence of pyelitis: First, an obstruction to the urinary outflow; and secondly, an infection. De Lee asserts that 15 per cent. of pregnant women have bacteriuria. This fact, together with the pressure of the enlarging uterus and the distortion of the ureters incident to pregnancy, furnishes the reason for the comparative frequency with which the condition appears in pregnant women. According to De Lee, the normal pressure of urine in the kidney pelvis is only 10 mm. Hg, so that slight causes may impede or check the outflow. The ureters, moreover, particularly the right, have been found dilated and filled with urine in about two-thirds of the pregnant women coming to autopsy.

The infecting organism is usually the colon bacillus, but others, such as the tubercle bacillus, the bacillus proteus, the staphylococcus albus and aureus, the bacillus typhosus, the gonococcus, the streptococcus, etc., have been reported. The organisms reach the pelvis of the kidney and ureter through the kidney tubules, being excreted through the kidney (bacteriuria), through the blood-stream, or by way of the lymph-channels, from neighboring structures (appendix, colon), and by ascending from the bladder either along the mucosa, as was previously believed, or by floating from a lower to a higher level in a collection of stagnant urine in an obstructed ureter, or through the periureteral lymphatics to the subpelvic areolar tissue that surrounds the blood-vessels of the kidney as they enter the pelvis.

Cabot and Crabtree have recently declared that the colon bacillus and the typhoid bacillus produce a different set of lesions in the kidney than do the streptococcus, staphylococcus, etc.

The colon-typhoid group causes acute pyelitis, acute pyelonephritis, chronic pyelonephritis, and pyonephrosis, whereas the coccus group causes perinephritic abscess, capsular abscess, capsulitis, cortical abscess, septic infarct, and diffuse suppuration. A mixed infection will show lesions characteristic of both groups.

Acute pyelitis is more frequently associated with the rapidly growing tumor of pregnancy than with other pelvic tumors. Occasionally, however, it develops suddenly during the course of the growth of a fibroid. Pyeloureteritis may also follow septic catheterization or an acute gonorrhoeal or a post-operative cystitis. In pregnancy it may develop as early as the eighth week. Usually it occurs about the fifth month or later. Occasionally it is observed during the puerperium, when it may be mistaken for septic infection. The right kidney is more frequently involved than the left.

Chronic pyelitis is much less violent than acute pyelitis in its manifestations. It results from gradually produced stasis of urine plus an infection. The latter is usually caused by the colon bacillus, less often by the gonococcus and the tubercle bacillus. The infection may come from the kidney, from the bladder, from the neighboring parts, or through the blood-stream. The cause of the obstruction may be a dislocation downward of the uterus and bladder, a slowly growing tumor compressing or constricting the ureter (fibroid tumor, carcinoma), a ureteral calculus, or contraction of the ureter following operative trauma, etc.

Symptoms.—Although symptoms such as frequent and painful urination may precede the onset, acute pyelitis usually presents itself with chill, fever, and pain along the course of the ureter and in the back. Vesical tenesmus, pain on urination, and a diminution of the urinary output are also present. The temperature often reaches 104° to 105° F., the rise usually being preceded by a prolonged and exhausting chill. The kidney on the affected side is markedly tender, and enlargement may be perceptible. Examination of the urine shows the presence of large numbers of pus-cells, epithelial cells, and albumin. The ureter can sometimes be palpated through the vagina as an enlarged and tender cord.

In the course of several hours or days the subjective symptoms may abate, the temperature declines, the pain subsides, the urine is voided in larger quantities, and contains an increased amount of pus and albumin. All may then go well for from twenty-four to seventy-two hours, when the symptoms may suddenly reappear.

The attacks follow one another at different intervals and with varying intensity. In the milder cases prostration may not be marked, but in the severer ones the patient becomes emaciated, and the face assumes a hectic appearance. At first, at least, but one kidney, and that the right, is usually involved, but after several days or a week there may be pain along the opposite ureter and indications of an extension of the disease in that direction.

The presence of kidney involvement is indicated by the disproportionate increase of albumin as compared with the number of leucocytes in the urine. Casts will also appear if there is any extension of the inflammatory process to the kidney structure.

Prognosis.—Acute pyelitis may yield rapidly to treatment, or it may prove exceedingly stubborn and resistant to all methods of treatment. The prognosis in general is favorable, *i.e.*, recovery usually occurs in from two to eight weeks. Labor and the emptying of the uterus are, as a rule, followed by rapid disappearance of the symptoms. Pyelitis may manifest itself

during the puerperium, constituting a form of puerperal sepsis. Acute pyelitis due to the pressure of pelvic tumors is cured by the removal or displacement of such growths, the pressure on the ureter being relieved. The prognosis in chronic pyelitis is dependent upon the nature of the infection and the organic changes that have occurred, *e.g.*, whether the infection is caused by the colon bacillus, on the one hand, or by the tubercle bacillus, on the other; whether the obstruction can be overcome, the amount of dilatation of the ureter that is present, and the extent to which the kidney pelvis is distended.

The prognosis in chronic pyelitis in cases of long standing and in those associated with recurring or permanent dilatation of the kidney pelvis and residual urine is less favorable (see Hydronephrosis, page 470). In such cases, when no more radical measures are practicable, local treatment should be employed, even though nothing more than temporary improvement is to be expected. According to Geraghty, in these cases formaldehyde solutions, varying in strength from 1:5000 to 1:2000, seem more effectual than the silver preparations.

Treatment.—The treatment of acute pyelitis complicating pregnancy is postural, general, medicinal, and local. The patient should be placed in the Sims' position, on the healthy side, the elevation of the hips being exaggerated by means of a hard pillow. The knee-chest position should be assumed several times within the twenty-four hours. The bowels should be kept open. Vegetable soups, milk in any form, and buttermilk may be taken. Water should be drunk freely. Solids and meat broths are to be prohibited. A urinary antiseptic, such as hexamethylenamine (5 grains) with sodium benzoate (5 grains) should be administered every three hours. Salol, 5 grains every three hours, is often the most effectual urinary antiseptic.

If this treatment does not alleviate the symptoms, the ureter of the affected side should be catheterized and the ureter and kidney pelvis irrigated with a boric acid or normal salt solution, followed by a 10 per cent. solution of argyrol. This has two objects: First, to relieve obstruction of the ureter and drain accumulated urine and pus; and secondly, to destroy or weaken the infecting organisms. This last may need to be repeated, or one thorough irrigation may be sufficient to mark the beginning of an improvement which is gradually followed by complete disappearance of the symptoms. If, in spite of every effort, the symptoms persist or even increase in violence, and the patient is almost constantly in pain, the anæmia increasing rapidly, and a typhoid-like condition making its appearance, labor should be induced without hesitation. Acute pyelitis occurring as a symptom of pelvic tumors should be treated in the same way as the acute pyelitis of pregnancy. When the acute symptoms have subsided, the patient should be subjected to operation, in order to avoid a repetition of the attacks. If the symptoms persist in spite of rest in bed, urinary antiseptics, and irrigation, operation should be undertaken at once, nitrous oxide-oxygen-ether anæsthesia being employed.

The treatment of chronic pyelitis is dependent upon the form of infection and the nature and source of the obstruction. Tuberculous cases need not be discussed here further than to state that as soon as the diagnosis is made, nephrectomy should be undertaken, provided the other kidney is healthy.

The local treatment of other forms of chronic pyelitis comprises relief of the urinary stasis in the affected ureter if this exists, the use of antiseptic solutions, and the injection of vaccines. The measures taken to relieve the urinary stasis depend upon the nature of the obstruction to the ureter. If this is caused by external pressure on the ureter, as in pregnancy, postural treatment, in addition to ureteral catheterization, may be effectual. Tumors or inflammatory masses pressing upon the ureter must be removed. A ureteral stone will, of course, require appropriate treatment, which is discussed elsewhere.

Obstruction due to prolapse of the uterus and bladder may be temporarily relieved by wearing a pessary, or may be permanently cured by operation. Obstruction caused by infiltration of the broad ligament by carcinoma is usually irremediable. Obstruction of the ureter associated with ptosis of the kidney and kinking may be relieved by wearing a belt and a pad, or by means of the suspension operation.

A narrowing of the ureteral lumen or stricture may be corrected by the passage of ureteral catheters or bougies (see Ureteral Stricture, page 495). Indeed, in some cases this, in addition to urinary antiseptics and diluents, seems to be all that is needed. In the majority of cases, however, lavage of the kidney pelvis with boric acid solution, aluminum acetate, 2 per cent., argyrol, 25 per cent., or silver nitrate, 1:1000 will prove of value and will hasten the cure. Silver nitrate irrigation should be followed by normal salt solution.

In practising lavage of the kidney pelvis the affected ureter should be catheterized by means of a small catheter. It should be of such size relative to the diameter of the ureteral lumen that there will be abundant space for a return flow of the irrigating solution into the bladder, whence it should be conducted immediately by a self-retaining catheter.

After introducing the ureteral catheter, a little time should be allowed for drainage of the kidney pelvis. The irrigating solution is then permitted to flow into the catheter by means of gravity, using a burette or funnel. On the average, about 75 c.c. of the combined irrigating solution may be used at one sitting. The treatment may be repeated at intervals of from three to four days to several weeks, depending upon the effect produced and the urgency of the symptoms.

If the treatment is carefully carried out, no unfavorable reaction will result. The slight discomfort that immediately follows the procedure subsides in the course of a few hours. The patient should not be considered cured until repeated examinations of the urine show it to be free from pus-cells and bacteria.

Although the use of vaccines in the treatment of chronic pyelitis has not been encouraging, so far as can be judged from the literature, good results unquestionably follow in some cases: it may be used either alone or in conjunction with other treatment.

At the time of the first ureteral catheterization a culture should be taken of the urine and a vaccine made therefrom; autogenous vaccines are preferable to stock vaccine.

URETERITIS

Inflammatory diseases of the ureter usually coexist with cystitis or pyelitis, or with both. Thus the ureter may become diseased from the descent of an infection from the kidney above, or the condition may be the result of the ascent of an infection from the bladder below. The three most common infections of the ureter correspond, therefore, to those most frequently encountered in the kidney and in the bladder. They are colon bacillus, tubercle bacillus, and gonococcus infections. Primary ureteritis may follow the lodgement of a stone in the ureter, or it may be caused by trauma during operation.

Symptoms.—Ureteritis secondary to pyelitis manifests no symptoms, for pyelitis is associated almost immediately with pain along the course of the ureter. The onset of pain radiating from the pubes to the lumbar region on one side during the course of cystitis may, however, indicate the beginning of a ureteritis secondary to cystitis.

Diagnosis.—Inspection of the ureteral orifices and bimanual palpation of the ureter are the only reliable physical methods for determining the existence of ureteritis, but they may fail to confirm the diagnosis unless the ureter is seriously diseased. Changes in the ureteral orifice, such as marked infection, bullous oedema, dilatation and fixation (*i.e.*, a lack of contractile power) are indicative of ureteritis. Palpation of the ureters in the anterior vaginal vault, from a point about one and one-half inches from the urethral orifice and a half inch on either side of the median line, outward and upward toward the bases of the broad ligaments, may reveal tender cords, the thickness of a lead-pencil, "passing in a flat curve with the concavity directed upward from the vaginal vault to the lateral wall of the pelvis."

Treatment.—The treatment of ureteritis is the treatment of pyelitis (page 487).

URETERAL CALCULUS

Etiology and Pathology.—Stone in the ureter is secondary to renal calculus, *i.e.*, the stone has its origin in the kidney, but escapes from the calyces or pelvis and lodges in the ureter. It may be found at the ureteropelvic junction, in the upper third of the ureter, at the brim of the pelvis, in the pelvis at the ureterovesical junction, or within the intramural portion of the ureter. In the series of cases reported by Braasch and Moore, one-fourth of the ureteral calculi were lodged at the ureteropelvic junction or in the upper third of the ureter; three-fourths were lodged in the lower third; of the latter more than half were in the pelvic portion of the ureter and less than one-third were lodged at the ureterovesical junction, while most of the remainder were found in the intramural part of the ureter.

A calculus may move at intervals of a few hours, days, weeks, or months to a position further down the ureter. Such stones are often passed spontaneously into the bladder, from which they are discharged with the urine. If a calculus lodges in the ureter, the mucous coat of the ureter at this point gradually undergoes pressure atrophy or necrosis; the wall of the ureter in the adjacent region becomes dilated, permitting the urine to pass around the stone. The amount of ureteral dilatation that takes place depends upon

the degree of the obstruction. In well-marked cases of long standing the entire ureter above the stone becomes dilated (hydroureter), and even the kidney pelvis (hydronephrosis) may be affected. If the obstruction to the ureter is complete or nearly so, hydronephrosis with atrophy of the kidney substance may follow within a comparatively short interval. The presence of a stone in the ureter predisposes to infection, and this occurs ultimately in a large majority of the cases. Ureteritis, pyelitis, pyonephrosis, and perirenal abscess may occur as sequelæ.

Symptoms.—In cases of ureteral calculus it is usually possible to elicit a history of an acute attack of sharp pain in the loin or hypogastrium, radiating toward the bladder, accompanied by vesical irritability and gross or microscopic hæmaturia. The pain is due to an increase of intrarenal tension, the result of the urinary obstruction. The pain recurs in paroxysms and increases in severity until the stone is passed, or until the accumulated urine succeeds in forcing its way past the stone. When the stone escapes from the ureter, the attack subsides suddenly, but when the excretion of urine is diminished by the intrapelvic tension or enough dilatation of the ureter in the vicinity of the stone occurs to permit passage of the urine around it, the attack subsides slowly. As a rule, the attacks are repeated from time to time until the stone is passed, or permanent changes take place in the ureter or kidney that markedly diminish the kidney excretion or overcome the obstruction to the urinary outflow. Although the severest pain is usually felt in the loin, it is sometimes referred to the upper abdominal quadrant, and occasionally to the region of the lower ureter. Vesical irritability is almost invariably present during the attacks of renal colic due to ureteral calculus. In nearly half of the cases the urine is bloody, but in a very few no blood may be visible even microscopically. In the intervals between attacks the patient may be perfectly well, or there may be a feeling of uneasiness or distress in the loin or along the course of the ureter, this being increased by riding or by active exercise. The urine may be free of red blood-cells, but, as a rule, they are present coincidentally with an aggravation of localizing symptoms. Sooner or later infection takes place, bacteriuria and pyuria make their appearance, and to the symptoms previously noted may be added those of pyelitis, pyonephrosis, etc.

When the acute paroxysms of pain in ureteral calculus are referred principally to the area of the lower ureter, they may simulate appendicitis, torsion or tubal or ovarian tumors, or the pain of tubal abortion or rupture in ectopic pregnancy.

Diagnosis.—Most important and most difficult in such cases is the differentiation of ureteral colic on the right side from appendicitis. The chief points of difference between them are found in the constituents of the urine, the white blood count, and the temperature.

Although an inflamed appendix that has become adherent to the ureter may give rise to sufficiently marked ureteritis to result in the appearance of blood and pus in the urine (Hunner's cases), this is most unusual, so that a catheterized urine highly charged with oxalates or urates and containing blood-cells, with or without leucocytes, points strongly to the presence of a ureteral calculus.

In uncomplicated cases of ureteral colic there is no elevation of tem-

perature. When the ureteral stone is complicated by infection, indubitable evidence of the condition is found in the urine (pyuria, bacteriuria, etc.). Elevation of temperature, therefore, with normal urine points to appendix involvement.

Increase in the white blood-cells is not the rule in ureteral stone unless evidences of infection are present in the urine, but this increase is quite customary and almost invariably present in appendicitis (see page 106).

There are other points of differentiation: For example, the pain of an appendicitis is usually most marked about McBurney's point, whereas in right ureteral colic, at the height of the paroxysms, the pain, even though most severe in the lower ureteral area, is nearly always present to some degree in the loin, and follows the course of the ureter. Bladder symptoms are almost invariably present in ureteral calculus, but are quite unusual in appendicitis.

A positive diagnosis of ureteral calculus often demands cystoscopic examination, ureteral catheterization, a röntgenogram, or pyelography. In some cases cystoscopic exposure of the ureteral orifice on the suspected side will reveal the presence of a stone projecting from or plugging the ureter. If the stone is higher up, it may be recognized as a point of obstruction to the passage of a ureteral catheter, either rendering difficult or absolutely preventing further introduction of the instrument.

The Röntgen ray, as a rule, furnishes the most positive and reliable information. Before the picture is taken the bowels should be thoroughly moved with castor-oil. If, after one picture has been taken, the position of a shadow gives rise to doubt as to whether the stone is a ureteral calculus or a phlebolith, the ureter should first be catheterized with a styletted or bismuth catheter, and then another picture taken. Stereoscopic röntgenograms are sometimes required to determine whether a given shadow is due to the presence of an object within or just over the ureter. The limitations of the röntgenogram are shown by Israel's report of sixty operations for ureteral stone. In almost 12 per cent. the picture was negative in spite of the fact that a stone was present.

In one case seen by Clark and Keene, the injection of the ureter with collargol prior to taking the röntgenogram greatly strengthened the shadow of a calculus that had previously not interrupted the rays to a marked degree. From this it may be seen that we have in pyelography a useful additional diagnostic measure.

Kelly has advocated the passage of wax-tipped catheters into the suspected ureter, the presence of a stone being indicated by scratch-marks on the wax of the catheter. This procedure may be carried out in conjunction with his direct method of cystoscopy and catheterization of the ureters, or with the indirect cystoscopic examination in a water-distended bladder.

"The technic which Geraghty and Hinman employ in the use of the wax-tipped catheter consists in passing the waxed end into the bladder; the butt end is threaded backward into a catheterizing cystoscope, which is then passed into the bladder over the catheter as a guide. At no time must the wax portion come in contact with the metal of the instrument. After the instrument is in the bladder the catheter is slowly withdrawn until the wax tip appears in the cysto-

scopic field, when it should be carefully examined to preclude the possibility of its having been scratched by any of the previous maneuvers. After the examination the instrument is removed first and then the catheter. As a rule, scratches produced by the contact of a stone are very definite and unmistakable" (Clark, *Prog. Med.*, 1916, p. 307).

Treatment.—During an acute attack of ureteral colic the patient should be kept in bed, where she will unconsciously assume the most comfortable position, *i.e.*, lie on the affected side with the knee strongly flexed on the abdomen. A vigorous purgative (castor-oil or epsom salts), supplemented, if need be, with a high enema, should be administered. Heat should be applied to the loin and to the lower anterior abdominal surface. If, in spite of these measures, the pain continues to be unbearable, hypodermic injections of morphine and atropin should be given. These not only relieve pain, but also, by relaxing the ureteral muscles, apparently favor the passage of the calculus into the bladder.

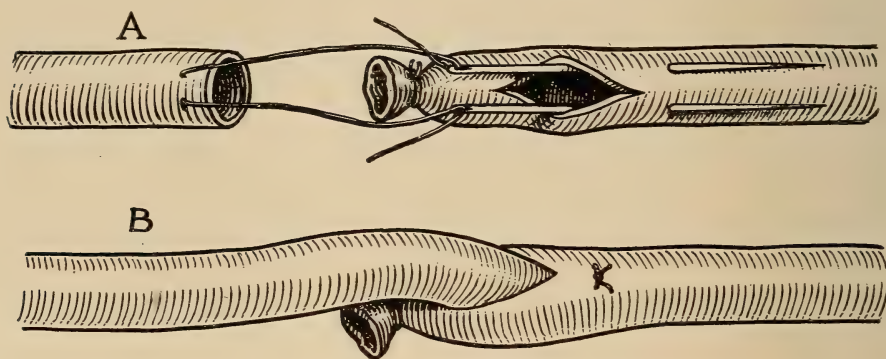


FIG. 415.—Ureteral anastomosis. End to side. Van Hook's method.

If the attack is especially severe, cystoscopic examination may be attempted. If, fortunately, the stone presents at the ureteral orifice, it may be removed, by the method subsequently to be described. If it is situated higher up, a ureteral catheter should be passed a short distance into the urethra and a small quantity of sterile oil injected. During the attack the patient should drink water freely. As the pain subsides, water should be taken in large quantities, together with a diuretic, to render the urine less acid or less alkaline, as the case may be.

If a ureteral calculus presents at the ureteral orifice, attempts may be made to dislodge it by performing bimanual stroking or massage. The ureter may be located by inserting two fingers into the vagina, approximating the tips of the fingers and the abdominal palpating hand along the course of the ureter and above the stone. The ureter is now stroked downwards toward the bladder, a maneuver that sometimes proves successful. The stone may be removed from the bladder with a delicate forceps passed through or alongside of a cystoscope.

If the stone cannot be dislodged with bimanual manipulation, an attempt may be made to grasp it from inside the bladder with an alligator forceps.

If, however, the ureteral orifice is so constricted as to prevent the securing of a good purchase by the instrument or as to hinder extraction, the orifice may be dilated with a bougie or forceps. The injection of a small quantity of sweet oil into the ureter may facilitate the escape of the stone.

Operative Treatment.—A stone in the ureter that is giving rise to no active symptoms may be disregarded for a time in the hope that it will pass. When it shows no tendency to do so, and all attempts to dislodge it by bimanual stroking, catheterization, or injection of oil fail; when characteristic pain persists, with no change in the position of the calculus; and when the stone is so large as to preclude its spontaneous passage, operation is advisable.

The form of operative procedure is dependent upon the location of the stone.

Stone in the Upper Ureter.—The kidney and ureter are exposed by a lumbar incision and the stone is located by palpation. The ureter is separated from the surrounding fat, and a longitudinal incision 1 to 1½ cm. in length, is made over the lower pole of the stone, which is then grasped with forceps and withdrawn.

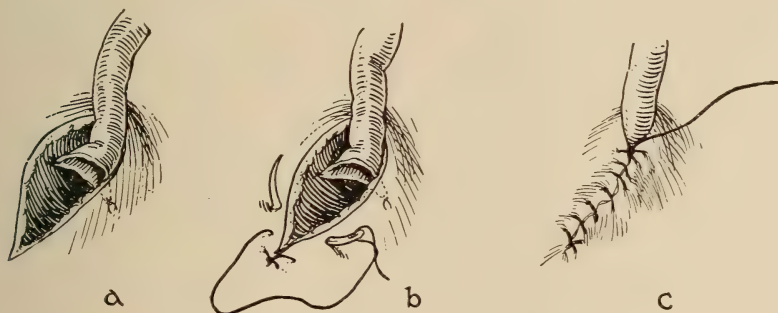


FIG. 416.—Uretero-vesical anastomosis. (After Judd.)

Stone at the Pelvic Brim.—The ureter is exposed by a muscle-splitting incision at about the level of the anterior-superior spine. The peritoneum is displaced mesially, and the iliac vessels are exposed. The ureter will be found close by, remaining attached to the peritoneum as it is lifted up and away from the vessels. The stone is located by palpation, the ureter is exposed, the calculus is fixed by grasping the ureter above and below, and a longitudinal incision is made directly over the upper or lower pole, whichever one is most convenient. The stone is expressed or removed with forceps.

Stone at the Pelvic Floor.—An incision is made in the semilunar line, below the anterior-superior spine. The peritoneum is pushed to the median line, and the iliac vessels and ureter are exposed. The stone is located by palpation, and one of two plans is adopted: either the stone is gently pressed upward, by palpation, to a higher level, where it can be easily reached, or the ureter is opened above the stone, at a convenient point and the stone extracted with a long, slender ureteral forceps.

Stone in the Vesical Portion of the Ureter.—A stone in this situation may present many difficulties. If it is palpable per vaginam, the ureter

should be exposed by an incision through the vaginal wall, the ureter opened by a longitudinal incision, and the stone extracted.

When the stone is not palpable per vaginam, the ureter should be exposed extraperitoneally by an incision in the semilunar line. The dissection of the ureter is carried down to the point where the ureter passes beneath the uterine vessels. The latter are hooked up on the finger, tied in two places, a centimeter apart, and divided. The ureter can then be safely exposed in its lowest part. A longitudinal incision is made, and the stone extracted. Counter-pressure in the vaginal vault and base of the bladder by an assistant may greatly facilitate this procedure.

Stone in the Intraparietal Ureter.—If a stone in that portion of the ureter that is situated in the bladder wall can plainly be felt per vaginam, it should be dealt with by division of the vaginal wall, dissection of the base of the bladder and terminal ureter, incision, and extraction.

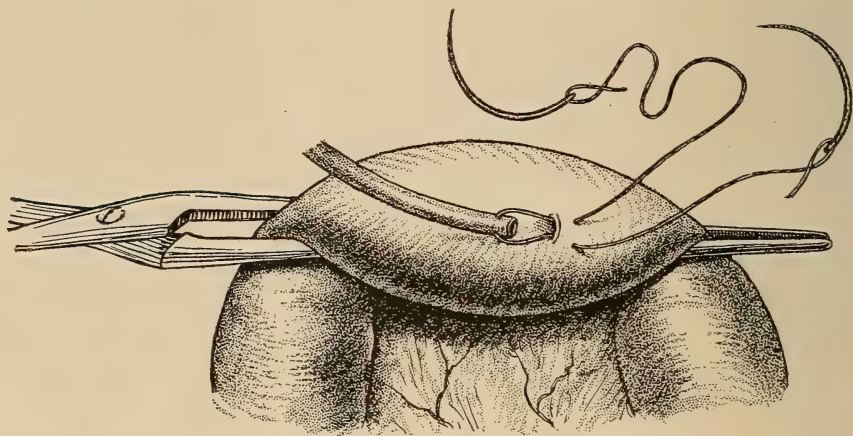


FIG. 417.—Method of implanting ureter into the intestine. (After Stiles.)

When attack from below promises to be difficult, a transvesical exposure of the ureter may be made, after exposing the trigone by a suprapubic extraperitoneal incision. But in most cases in women the procedure of choice consists in vaginal cystotomy with the patient in the knee-chest position. The incision through the vesicovaginal septum is made in the midline, about half-way between the internal ureteral orifice and the cervix. The position of the calculus is then determined by palpation, after which the corresponding area of the mucosa is exposed by means of suitable retraction. An incision is then made either through the rim of the ureteral orifice or close to the orifice in the line of the ureter, and the stone extracted. Closure of the vesicovaginal incision and the institution of continuous drainage of the bladder for a few days complete the operation.

In all operations for stone in the ureter the periureteral sheath and its blood supply must be carefully conserved. When the stone is located it should be fixed by making compression of the ureter above and below, either by light, rubber-covered clamps or by the fingers of the operator or his assistant.

The ureteral incision should always be as small as will suffice for the extraction of the calculus, and always placed exactly in the median line.

In every instance an attempt should be made to coapt the edges of the ureteral incision with a suture of fine catgut that includes the periureteral sheath and the muscular coat of the ureter, but not the mucosa.

In *extraperitoneal operations* the wound should be drained for a few hours, but care should be taken that the drain does not come in contact with the ureter.

After *vaginal exposure* of the ureter the vaginal incision should be closed with interrupted sutures.

STRICTURE OF THE URETER

Etiology.—Stricture of the ureter has been attributed to a variety of causes, among which may be mentioned congenital narrowing; ureteritis from

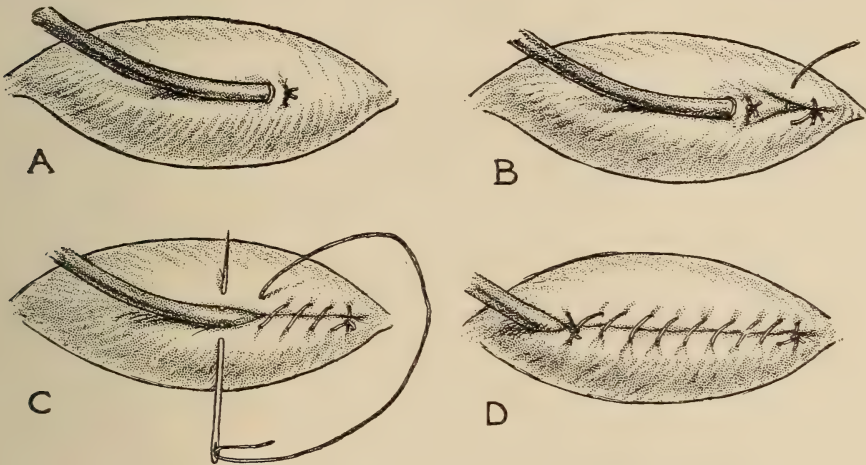


FIG. 418.—Method of implanting ureter into the intestine. (After Stiles.)

the ordinary pyogenic organisms, the gonococcus, and the tubercle bacillus; healing of a ureteral fistula following injury incident to labor, the Wertheim operation for carcinoma of cervix; direct trauma, syphilis, and infection of the cervix. Hunner, who has made an exhaustive study of the subject, although admitting that any of the foregoing factors may play an active rôle in the etiology of ureteral stricture, is convinced that "the majority of ureter strictures, excluding those of tuberculous origin, should be classified as simple, chronic stricture; they originate in an infection carried to the ureter walls from some distant focus, such as diseased tonsils, sinuses, the teeth, or gastro-intestinal tract." "This conception of stricture," he asserts, "postulates that in the majority of cases ureter infiltration is primary, and that the other urinary tract lesions, so often associated with stricture, such as stone in the ureter, hydronephrosis, pyelitis, and pyelonephrosis, are secondary."

Symptoms.—Pain (*i.e.*, nagging discomfort) at the site of the stricture is usual. With this there may be pain radiating upward toward the kidney,

laterally into the hips or groin, posteriorly, simulating a sacroiliac joint condition or sciatica, and downward into the thigh and leg in front or back. There is also in many cases intermittent pain in the kidney region, due to overdistention of the kidney pelvis. Bladder discomfort and frequency of urination are quite common in connection with the recurring renal attacks.

Fever, chills, and leucocytosis, as in pyelitis, may occur intermittently when active urinary infection is present and the obstruction for some reason becomes more marked. Infected cases may go for weeks or months without chills or appreciable fever, the only symptoms being malaise and general depression. In rare cases febrile symptoms may be present when there is no infection of the urine; in one case of this sort reported by Hunner the symptoms subsided after tonsillectomy had been performed.

If there is an associated pyelitis, the urine displays the pathologic findings and variations common to that condition. If there is no urinary infection, a few leucocytes or erythrocytes or both may, nevertheless, be found, or the urine may be quite normal.

Gastro-intestinal symptoms are common, and consist of slight nausea and aversion to food or extreme and persistent nausea and vomiting, gaseous distention, rectal tenesmus, and frequent desire to defecate, with pain just before or during the stool. As a result of the stricture colitis may occur.

General symptoms indicative of disturbed kidney function have been noted, such as headache, nausea, etc., and in some cases morbid mental conditions have been observed.

Pathology.—The inflammatory area varies from a slight, annular thickening in the wall of the ureter to a diffuse cartilaginous thickening that may be several centimeters in length and a centimeter in diameter. Multiple annular strictures are not uncommon. Associated with this condition there may be periureteritis; thus Hunner states that at operation he has often been unable to determine by palpation whether he is dealing only with a stricture or with a stricture plus stone.

In by far the greatest number of cases the site of the stricture is in the broad ligament region, within 6 cm. of the bladder; the next most frequent location is at the bifurcation of the internal iliac vessels, or about 8 to 10 cm. above the bladder (3 to 5 cm. below the pelvic brim). In a series of 100 cases, 70 were unilateral and the remainder bilateral. As regards the coexistence, in these cases, of urinary stasis, dilatation of the kidney pelvis, and urinary infection, which Hunner believes are secondary to stricture formation, an analysis of his cases showed that of the first 50 (an examination of urine for pus and cultures was not made in all) there were 16 non-infected and 18 infected cases (colon, 13; staphylococcus, 4; typhoid, 1). The average capacity of the kidney pelvis in the non-infected group was 19 c.c.; in the infected cases it was 98 c.c. (the average normal capacity is from 6 to 8 c.c.); the average duration of symptoms was greater in the first than in the second group.

In the second group of cases, which were all studied bacteriologically, 11 were infected (colon, 8; staphylococcus, 1; streptococcus, 1; unidentified, 1). Four of the infected cases showed a pelvic capacity ranging from 15 to 20 c.c.; the average pelvic capacity was 16 c.c. The average duration of symptoms in the infected cases was shorter than in the non-infected.

Hunner believes that many ureteral stones are unquestionably caused by ureteral stricture and are formed at the site of constriction.

Diagnosis.—The diagnosis is based on the symptoms previously noted. In addition, local tenderness over the ureter at the pelvic brim may be elicited by palpation. In the vast majority of cases vaginal palpation will show the greatest tenderness in the broad ligament region, and at times the enlargement of the ureter can be detected. Cystoscopy is usually negative, but urethral stricture is quite often found. In Hunner's last 28 cases of ureteral stricture 27 had stricture of the urethra. When the stricture is in the bladder wall region, slight redness and œdema may be found about the ureteral orifice.

The decisive test is made by passing a wax-bulbed ureteral catheter. It is not the obstruction that is met on introduction, but the "hang" or catch of the wax bulb upon withdrawal of the catheter from the ureter, that is the determining factor. Pyeloureterograms after a sodium bromide or a thorium injection are useful, especially when the ureteral catheter cannot be made to pass the obstruction.

Treatment.—The ideal method of treatment has for its object dilatation of the stricture from below. For this purpose ureteral catheters of various sorts and sizes may be used, either armed with a waxed bulb (pure beeswax) or plain. In strictures of small caliber the passage of the catheter is often difficult or impossible. In these cases the olive, round-point, and whistle-tip catheter should be tried in succession. If all fail, a whalebone filiform bougie should be introduced to the point of obstruction, succeeded by another and still another until one finally engages in the lumen and passes through. This last filiform should be left in place and a smaller catheter be tried. Waxing the end of the catheter may facilitate its introduction, especially if the wax is given a corkscrew configuration and rotated as it engages the obstructed area. Dilatation of the stricture should be made either with plain catheters or with catheters with waxed bulbs of increasing size. For the first dilatation Hunner advises a waxed bulb no larger than 3 to 5 mm.; even at later periods the maximum size should not exceed 5 to 6 mm.

The treatment should not be repeated oftener than once in ten days, thus permitting the traumatic œdema that follows the dilatation to subside. When pyelitis is present, lavage may be practised at ten-day intervals until some dilatation has been effected, when it may be employed oftener (twice a week). If the condition is bilateral, both sides should not be treated at the same sitting.

When the stricture cannot be dilated from below, and especially if it is situated high up, some form of ureteroplasty may be required. A valve-like obstruction at the ureteropelvic junction, such as is seen in floating kidney, may sometimes be overcome by suspension of the kidney.

Retrograde dilatation will often be more useful than ureteroplasty. The ureter is exposed by operation above the obstructed point, and catheters or sounds of increasing size are passed downward through the stricture, dilating it from 5 to 7 mm. After this operative dilatation the stricture can usually be passed from below.

Obstruction of the Ureter.—Obstruction of the ureter may be caused by compression due to a pelvic growth pressing upon or invading its walls and

sheath, as, for example, myomata of the uterus (especially the intraligamentous and subvesical varieties) or carcinoma of the cervix or neighboring organs, which involves the cellular tissue in the bases of the broad ligaments. The condition is slow in onset and may escape observation, being merged in the symptoms of the pelvic lesion producing the obstruction. In such cases it aggravates the condition of the patient and may be a very potent factor in hastening her decline. Thus, for example, obstruction of the ureter due to carcinomatous infiltration, often gives rise to no striking symptoms, and yet the gradually developing hydroureter, hydronephrosis, diminution in kidney function, and uræmia are solely due to the obstruction. This may also be true, but to a lesser degree, of a myoma or of any tumor that presses upon the ureter.

Symptoms.—The symptoms that first attract attention to the condition are usually those of pyelitis, which occurs secondarily to the obstruction, and which will subside as soon as the obstruction is removed.

Treatment.—The treatment of obstruction of the ureter from all these causes is the treatment of the provocative lesion.

URETERAL FISTULÆ

See Urinary Fistulæ (Chapter XXIV, page 463).

URETERAL LIGATION

See Post-operative Complications—Suppression of Urine (Chapter XXXVIII, page 686).

URETERAL TEAR OR INJURY

See General Operative Technic—Injury to Viscera During Operation (Chapter XXXVI, page 642).

BIBLIOGRAPHY

- BACHARACH, R.: "Nephrektomie bei bilateraler Tuberkulose." *Zeitsch. f. Urol.*, 1914, viii, 98.
- BINNEY, HORACE: "The Value of High-Frequency Current in the Treatment of Vesical Papillomata." *Boston Med. and Surg. Jour.*, 1913, clxviii, 308.
- BISSELL, D.: "The Surgical Treatment of the Tubercular Ureter in the Female." *S., G. and O.*, No. 5, 1915, xxi, 615.
- BRAASCH, WM. F., AND MOORE, A. B.: "Stones in the Ureter." *J. A. M. A.*, 1915, lxxv, 1234.
- CABOT, H.: "Stone in the Kidney and Ureter." *J. A. M. A.*, 1915, lxxv, 1233.
- CABOT, H., AND CRABTREE, E. G.: "The Etiology and Pathology of Non-Tuberculous Renal Infections." *S., G. and O.*, 1916, No. 5, xxiii, 495; *Ibid.*: "The End-Results of Seventy Cases of Renal Tuberculosis Treated by Nephrectomy." *S., G. and O.*, 1915, No. 6, xxi, 669.
- Clark, J. G., AND BLOCK, F. B.: "Ultimate Results Following Nephropexy in Cases of Symptomatic Nephroposis." *Annals of Surgery*, 1917, lxxvi, 479.
- CLARK, W. L.: "The Uses of Desiccation Surgery in Gynecology." *Am. Jour. Obst.*, 1915, lxxii, 63.
- DAVID, V. C.: "A Bacteriologic Study of Fifty Cases of Non-Tuberculous Diseases of the Bladder and Kidney." *Surg., Gynec. and Obst.*, 1914, xviii, 432.
- DIETL: "Wandernde Nieren und deren Einklemmung." *Wien. med. Wochenschr.*, 1864, Bd. xiv.
- EDEBOHLS: "The Technic of Nephropexy." *Annals of Surgery*, 1902, xxxv.
- EISENDRATH, D. N., AND KAHN, J. V.: "Rôle of the Lymphatics in Ascending Renal Infection." *J. A. M. A.*, 1916, lxxvi, 561.
- ELLIS, E. G., WITH W. W. KEEN AND G. E. PFAHLER: "On Hypernephroma." *Amer. Med.*, 1904, viii, 1039.
- FENGER: "Conservative Operative Treatment of Sacculated Kidney-Cystonephrosis." *Annals of Surgery*, June, 1896, xxiii.
- GARCEAU, EDGAR: "Treatment of Tubercular and Non-Tubercular Cystitis in the Female." *Amer. Jour. Obst.*, 1907, lvi, 289.

- GERAGHTY, J. T.: "The Treatment of Chronic Pyelitis." J. A. M. A., 1914, lxiii, 2211.
- GERAGHTY, J. T., AND HINMAN, F.: "Ureteral Calculi; Special Means of Diagnosis and Newer Methods of Intravesical Treatment." Surg., Gynec. and Obst., 1915, No. 5, xx, 515.
- GLÉNARD: Les ptoses viscérales (estomac, intestin, rein, foie, rate) diagnostic et nosographie (entéroptose, hépatisme). Paris, 1899.
- HAHN: "Die operative Behandlung der beweglichen Niere durch Fixation." Cent. f. Chir., 1881, Bd. viii, No. 29.
- HUNNER, G. L.: "Ureter Stricture in Women." Trans. Amer. Gyn. Soc., 1917, xlii, 520; *Ibid.*: "Chronic Urethritis and Chronic Ureteritis Caused by Tonsillitis." Jour. Amer. Med. Asso., 1911, lvi, 937; *Ibid.*: "The Diagnosis of Renal Calculus." Jour. Amer. Med. Asso., March 24, 1906; *Ibid.*: "Surgery of Urinary Tuberculosis in Women." Amer. Medicine, vii, No. 18, 701-707, April 30, 1904; *Ibid.*: "Treatment of the Renal Pelvis and Ureter by Means of the Renal Catheter." Trans. Amer. Urological Asso., 1909; *Ibid.*: "The Diagnosis and Treatment of Obscure Cases of Pyelitis and Hydro-nephrosis." International Clinics, iv, 22d Series; *Ibid.*: "Malposition of the Kidney." Charlotte Medical Journal; *Ibid.*: "Ureteral Stricture—Report of 100 Cases." Johns Hopkins Hospital Bulletin, January, 1918, No. 323, xxix; *Ibid.*: "Tuberculosis of the Urinary System in Women." Johns Hopkins Hospital Bulletin, 1904, xv, 8; *Ibid.*: Diseases of the Bladder and Urethra." Kelly-Noble, Gynecology and Abdominal Surgery, i, 438, 1907, W. B. Saunders Co., Phila.
- ISRAEL, J.: "Über Operationen wegen Uretersteinen." Folio Urologica, 1912, vii, 1; *Ibid.*: Chirurgische Klinik der Nierenkrankheiten. Berlin, 1901.
- KELLY, H. A., AND BURNAM, C. F.: The Diseases of the Kidneys, Ureters and Bladder. D. Appleton & Co., N. Y. and London, 1914.
- KOLL, I. S.: "The Experimental Effect of the Colon Bacillus on the Kidney." Jour. Amer. Med. Asso., 1915, lxiv, 297.
- KRETSCHMER, H. L., AND GAARDE, F. W.: "The Treatment of Chronic Colon Bacillus Pyelitis by Pelvic Lavage." Jour. Amer. Med. Asso., 1916, lxvi, 2052.
- KÜMMELL: "Modern Surgery of the Kidney." Surg., Gyn. and Obstet., January, 1907.
- KÜSTER: "Die Chirurgie der Nieren." Lief 52 b., Deutsche Chirurgie, Stuttgart, 1896.
- MONTGOMERY, E. E.: Practical Gynecology. Blakiston, Phila., 1907, 2nd Edition, 920.
- MORRIS: Surgical Diseases of the Kidney and Ureter. London, 1901.
- MAYO, WM. J.: "The Removal of Stones from the Kidney." Surg., Gyn. and Obst., 1917, xxiv, 1; *Ibid.*: "Procedures Following Nephrectomy." "The Management of the Ureter After Nephrectomy for Tuberculous Kidney." Jour. Amer. Med. Asso., 1915, lxiv, 954, 957.
- MORTON, J. J.: "A Rapid Method for the Diagnosis of Renal Tuberculosis by the Use of the X-rayed Guinea-pig." Jour. Exper. Med., 1916, xxiv, 419.
- NOBLE: "Some of the More Unusual Results of Movable Kidney." N. Y. Med. Jour., 1904, lxxix, 341.
- OPPENHEIMER, R.: "Die Pyelitis." Zeitschr. f. Urol. Chir., 1913, i, 17.
- PAWLIK, CARL: "Ueber die Harnleitersondirung beim Weibe." Archiv f. Klin. Chir., 1886, xxxiii, 717-739.
- SCHÉDE: Diseases of the Kidney. System of Surgery by v. Bergmann, edited by W. T. Bull, Phila., 1904, 262.
- SCHENCK: "Renal Hematuria of Unexplained Origin." Med. News, 1904, lxxxv.
- STEWART, D. D., AND KELLY, A. O. J.: "On the Occurrence of Primary Tuberculosis of the Kidney, with Special Reference to a Primary Miliary Form." Med. News, August 14-21, 1897, 193.
- SWEET, J. E., AND STEWART, L. F.: "The Ascending Infection of the Kidney." Surg., Gyn. and Obst., 1914, vol. xix, 195.
- TAUSSIG, F. J.: "Urethral Bacteria as a Factor in the Etiology of Cystitis in Women." Amer. Jour. Obst., 1906, liv, 465.
- WALKER, G.: "Tuberculosis of the Kidney." Kelly-Noble, Gynecology and Abdominal Surgery, ii, 783.
- WALKER: "Renal Tuberculosis." Johns Hopkins Hospital Reports, 1904, xii.
- WATSON, B. P.: "Primary Malignant Tumors of the Female Urethra." Amer. Jour. Obst., 1914, lxix, 795.

CHAPTER XXVI

DISEASES OF THE ABDOMINAL VISCERA RELATED TO, OR ASSOCIATED WITH, PELVIC DISORDERS

Introduction.—The treatment of pelvic disorders by operation will frequently reveal lesions of the neighboring abdominal organs that demand immediate relief. Certain diseases of the suprapelvic or true abdominal viscera may give rise to symptoms that closely resemble those that are entirely pelvic in origin. The proper differentiation of the former from the latter, the recognition of disorders within the true abdomen in connection with pelvic disorders, and the complete and satisfactory management of the entire intrapelvic and intra-abdominal derangement, whatever it may be, require a familiarity with the symptoms, differential diagnosis, and treatment of the diseases of the entire abdominal viscera. In this volume our discussion will be limited to those organs situated near the pelvis and most frequently associated with pelvic diseases, *i.e.*, the appendix, sigmoid flexure, and the rectum; appended to this is a discussion of the subject of viscerotoposis, a condition that is more frequent in women than in men.

APPENDICITIS

Involvement of the Appendix in Pelvic Disease.—Involvement of the appendix is frequently associated with intrapelvic disorders, particularly with those of an inflammatory nature. In the latter case the participation of the appendix in the process is usually altogether a secondary matter, and only the outer coats of the appendix are involved—periappendicitis. The mucosa is unaffected except indirectly, by reason of the interference with its blood supply or with the continuity of its lumen because of angulation resulting from adhesions. The appendix suffers because it is in bad company.

Secondary involvement of the right adnexa after a primary appendicitis is less common. This is due to a number of reasons: First, because operation is usually undertaken at an early stage in appendicitis and the diseased organ is removed; secondly, in neglected or perforating cases with spreading peritonitis, death ensues or recovery follows appendicectomy and drainage. The source of infection having been removed, the inflammatory process in the neighborhood rapidly declines, the inflammatory exudate is absorbed, and no permanent evidence whatever, or at most but a few adhesions immediately about the cæcum, may be left behind. An appendiceal abscess may gravitate into the pelvis, especially if the appendix originally was unusually long or the cæcum particularly low, in which event the ovary and the tube may be involved for a time. After evacuation of the abscess and drainage, the disorder will, in a majority of cases, rapidly subside and may leave no permanent mark. In some instances, nevertheless, chronic pelvic inflammatory disease is secondary to a previous attack of pelvic peritonitis complicating appendicitis (see Chapter VI, p. 96). The lesions consist of adhe-

sions between the uterus, adnexa, and pelvic peritoneum, closure of the tubes, thickening of the ovarian capsule, and cystic degeneration of the ovary.

Secondary involvement of the appendix is more frequent after primary adnexitis, since in a vast majority of the latter cases the process is slower and runs a protracted course, during which the pelvic peritonitis with its exudate is likely to involve every structure lying within or at the brim of the pelvis. Infection sometimes extends to the appendix from the broad ligament along the right infundibulo-pelvic ligament. Appendicitis may be acute or chronic. The differential diagnosis between appendicitis and inflammatory lesions of the right adnexa is of great importance.

Differential Diagnosis Between Acute Appendicitis and Acute Adnexitis.—The differential diagnosis is based upon a careful estimate of the history, symptoms, signs, and course of the disease.

The history will show that an acute appendicitis is often preceded by digestive disturbances. It is more prone to come on without any preceding disability than are adnexal disorders. The onset frequently follows over-indulgence at the table, the ingestion of unwholesome food, and neglect of the bowels. The onset bears no relation to the menstrual periods, miscarriage, or labor.

Acute salpingitis and acute ovaritis are usually preceded by evidences of pelvic disturbance such as irritable bladder, leucorrhœa, disorders of menstruation, backache, etc. Inflammatory attacks most often take place about the time of the menses and shortly after abortion or labor.

The symptoms of acute appendicitis consist, first, of pain in the epigastrium, nausea, vomiting, etc.; later there are a localization of pain and tenderness about McBurney's point, and rigidity and spasm of the right rectus muscle, the pain is relieved by flexion and increased by extension of the right thigh.

The temperature may be decidedly elevated (101° to 102° F.), but is frequently not much above normal (99° to 100° F.); the pulse is affected more often than the temperature (90 to 120); nausea, vomiting, and constipation usually are marked; leucocytosis is rarely lower than 15,000, and may be 20,000 or 25,000.

In right adnexitis the pain is lower, nearer the median line, and may extend to the left side; nausea and vomiting are less severe, but distention with gas probably more marked; vesical or rectal irritability and pain are more frequently present, and the rigidity and tenderness affects the entire lower abdomen. Although flexion of the thighs relieves the pain, and extension increases it, the movement of the right thigh alone does not so directly affect the pain as in appendicitis.

The temperature is usually high (101° to 103° F.), and the pulse-rate correspondingly increased (100 to 130); the leucocytes are increased, but usually to a lesser degree in gonorrhœal infections (10,000 to 15,000), and to a greater degree in post-abortion or post-partal ones (20,000 to 40,000).

Streptococcus, staphylococcus, and colon bacillus infections almost invariably follow septic abortion or labor, or intrauterine manipulations, so that the history is especially important in making the diagnosis.

The physical signs are of great value. The tenderness of acute appen-

dicitis is usually higher (McBurney's point) than in adnexitis, and more likely to extend to the right flank or upward toward the hypochondrium. The tenderness of adnexitis, as stated, is lower (just above Poupart's ligament), extending toward the median line to the opposite side, and to the front or the back of the thigh. A palpable mass above the pelvic brim on the right side is more likely to indicate an inflamed appendix than an inflammatory enlargement of the right adnexa which is not detectable, as a rule, by simple palpation through the abdominal wall.

Upon inspection of the genitalia in gonorrhœal cases, one finds pus in the urethra or in Bartholin's glands, or in a profuse, irritating, purulent discharge from the cervix; in infections following labor or abortion, there may be recent abrasions, lacerations, ulceration, and false membrane.

In the early stage, if the attack is an initial one, bimanual pelvic examination may disclose nothing more than great tenderness, local heat, and swelling. The adnexa cannot be palpated because the abdominal wall is too rigid and the resistance of the patient is too great. The uterus may be found to be slightly enlarged, very tender, and somewhat fixed. In the course of from twenty-four to thirty-six hours the physical signs in the pelvis undergo a change. By this time there is less impediment to palpation, and the structural changes that have occurred can be recognized. The uterus is fixed, the vaginal vault is hard, infiltrated, and very tender, and the evidence of pelvic exudate and inflammation are unmistakable.

As regards the course of the disease, the symptoms of an adnexal inflammation rapidly subside, as a rule, under conservative treatment (see pages 414-416). By the end of twenty-four hours the pain will begin to diminish, the distention grow less, the fever and the pulse-rate be reduced, and the patient be decidedly on the mend. This is true, for the most part, of gonorrhœal infections, but may not be so of a serious streptococcus infection. Since, however, the history or examination makes the evidences of the latter infection so clear, they need not be discussed here. While it is undoubtedly true that the milder forms of appendicitis frequently subside under appropriate treatment, in appendix inflammations of the severe type, a subsidence is less likely to take place, the rigidity, tenderness, distention, and slight elevation of temperature and pulse continue, while the leucocyte count steadily rises. A word of caution must be spoken regarding the significance of a sudden relief from pain in bad cases of appendicitis. It often means that perforation has taken place. If this possibility is remembered, the flushed face, coated tongue, tender abdomen, gaseous distention, limitation of peristalsis, increased pulse-rate, etc., will leave no doubt in the mind of the examiner as to the true state of affairs.

Treatment.—If appendicitis is positively diagnosticated and the patient is seen at the very onset and is in favorable condition, operation should be performed at once. In mild cases, if the patient objects to operation or desires to postpone it until a more convenient time, palliative measures may be adopted for from twelve to twenty-four hours.

When cases are seen late, the treatment should be modified according to the conditions that are found. If there are evidences of a spreading peritonitis, progressive distention, limitation of peristalsis, increase in pulse-rate

and in the number of leucocytes, etc., operation should be performed at once. If tumor formation has occurred and there are no indications of a diffuse peritonitis, the case may be treated expectantly for a few hours, in order to determine, as nearly as possible, whether the condition is advancing or retrogressing. If the symptoms do not abate, operation is indicated.

Not infrequently the symptoms remain in abeyance or tend to subside, and the tumor shrinks and finally disappears, or nearly so. In such cases operation should invariably be advised, but a later date selected. The advantages gained by waiting are a clean operation, less danger of spreading infection, fewer adhesions, and less trauma to the intestine. Every surgeon of experience has regretted operating in the stage of plastic exudate, when the appendix is buried and both it and the surrounding intestines are friable and difficult to handle. If the operation is performed two months later, when the process has subsided, it becomes as simple as the interval operation of a recurrent catarrhal appendicitis.

The palliative treatment of acute appendicitis comprises rest in bed, abstinence from food, and the application of an ice-bag to the right iliac fossa. If distention is distressing, the lower bowel may be emptied by a small enema (1 pint), by the passage of a rectal tube, or by the exhibition of suppositories of asafetida. *No cathartics should be administered.*

In cases seen later, with tumor formation but without evidences of spreading peritonitis, abstinence from food, the Fowler position, proctoclysis, and the application of an ice-bag to the affected area should be prescribed. After the symptoms have begun to subside, resolution may be hastened by the application of heat. The bowels may be moved daily by means of a small, carefully given enema, and the return to food be begun very cautiously and the diet increased only as the symptoms continue to subside. *Only after complete subsidence has occurred is the administration of a cathartic permissible.*

CHRONIC APPENDICITIS

Chronic appendicitis is usually a low-grade inflammation, the sequel to an acute attack. It may develop without acute manifestations.

The appendix may be elongated and hypertrophied, adherent, kinked, and distended with gas or with fecal concretions. Whatever the pathologic condition, there is interference with the normal drainage of the appendix into the cæcum or with the peristaltic action of the neighboring intestine.

Symptoms and Diagnosis.—The symptoms of chronic appendicitis consist of pain and soreness about McBurney's point, general abdominal distention and flatulence, diarrhœa, and constipation. Indiscretions in diet, neglect of the intestinal functions, and overexertion usually increase the symptoms. A rigid enforcement of dietary regulations, a daily laxative, and avoidance of exertion tend to diminish them. When the appendix is adherent to the pelvic structures, the recurring menstrual function may cause a periodic aggravation of symptoms, due to a congestion in the blood supply.

Differential Diagnosis Between Chronic Appendicitis and Chronic Adnexitis.—A differential diagnosis between chronic appendicitis and a lesion of the right tube and ovary may be necessary when the appendix is low and

the ovarian or tubal disturbance consists merely of adhesions to the surrounding structures. Such attachment of the tube and ovary may be difficult to diagnose if the adnexa are not enlarged and if they retain a fair degree of mobility. In the case of adnexal disease the symptoms are usually more marked at the menstrual periods.

If the lesion is in the appendix, there is a predominance of the intestinal symptoms, tympanites, flatulence, occasional abdominal distress after eating, constipation, and diarrhœa.

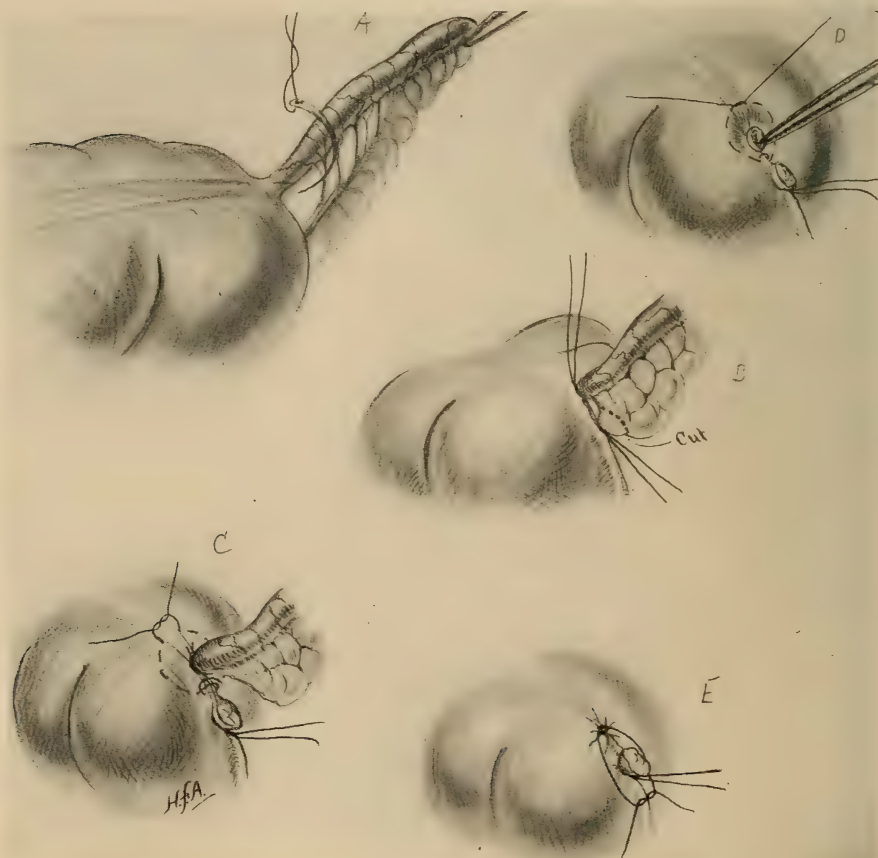


FIG. 410.—Appendicectomy: (A) ligation of meso-appendix; (B) ligation of appendix and line of division of meso-appendix; (C) circular suture with loop at vascular area; (D) inversion of stump; (E) stump of meso-appendix drawn over inverted base.

In adnexal lesions, chronic pelvic symptoms, backache, irregular menses, dysmenorrhœa, vesical irritability, leucorrhœa, etc., are more prone to occur.

Bastedo's sign (the production of pain in the appendix region on distention of the colon with air) may be looked for.

When both the appendix and the adnexa are involved, the symptoms of both conditions are combined. Recurrent exaggeration of appendix symptoms at the menstrual periods is often indicative of adhesions between the right adnexa and the appendix.

When a positive differential diagnosis can be made only with difficulty, examination under anæsthesia may be useful. The complete relaxation thus obtained permits detection of even slight enlargement or restriction of mobility of the adnexa.

OPERATIVE TECHNIC

The treatment consists in appendectomy. This may be performed in a number of ways, as may be seen from the accompanying illustrations. The operation is a simple one except when the appendix is densely adherent.

In performing operations upon acute cases, with spreading peritonitis, several important points must be borne in mind:

1. The patient should be kept in the elevated (semi-Fowler) position before, during, and after the operation.

2. A right rectus (Battle's) incision, of ample proportions to give a good exposure, should be made.

3. The appendix should be located by palpation and exposed by packing the intestines away from the appendix area with gauze wrung out of hot salt solution.

4. The appendix should be removed by the simplest method, and no attempt should be made to peritonealize the stump unless the cæcum is not involved and the procedure can be easily and rapidly carried out (Figs. 419 and 420).

5. Drainage should be provided by rubber tubes with gauze wicks—one going to the bottom of the pelvis, and the other to the right iliac fossa. The gauze packs should be left *in situ* until the drains are placed in position.

6. The peritoneum may be closed by continuous suture, but the fascia and skin should be closed with interrupted sutures placed a good distance apart, so as to encourage free external drainage. Most of the sutures should be of catgut, but a few supporting sutures of silkworm gut should also be used.

7. Nitrous oxide-oxygen-ether anæsthesia gives the best results.

8. Continuous enteroclysis and postural drainage (Fowler or semi-Fowler position) should supplement the operative treatment (for management of drains see page 661).

INTESTINAL STASIS

Acute Intestinal Stasis.—Acute intestinal stasis, or acute intestinal obstruction, is rare as a complication of pelvic disease, and its differentiation from pelvic disorders is not often demanded. Disease originating in the pelvis very rarely produces an acute obstruction of the alimentary canal. That acute obstruction may follow pelvic operations is true, and such a condition is discussed on page 680. Certain forms of acute intestinal obstruction, as, for example, intussusception, volvulus, etc., are prone to occur at the extremes of life, when acute pelvic disorders, with the possible exception of twisted pedicles, may be excluded. It is remarkable that pelvic inflammatory disease and pelvic tumors, although they encroach upon or compress or bind with adhesions the large and small intestinal loops that are found in the pelvis, almost never cause more than moderately

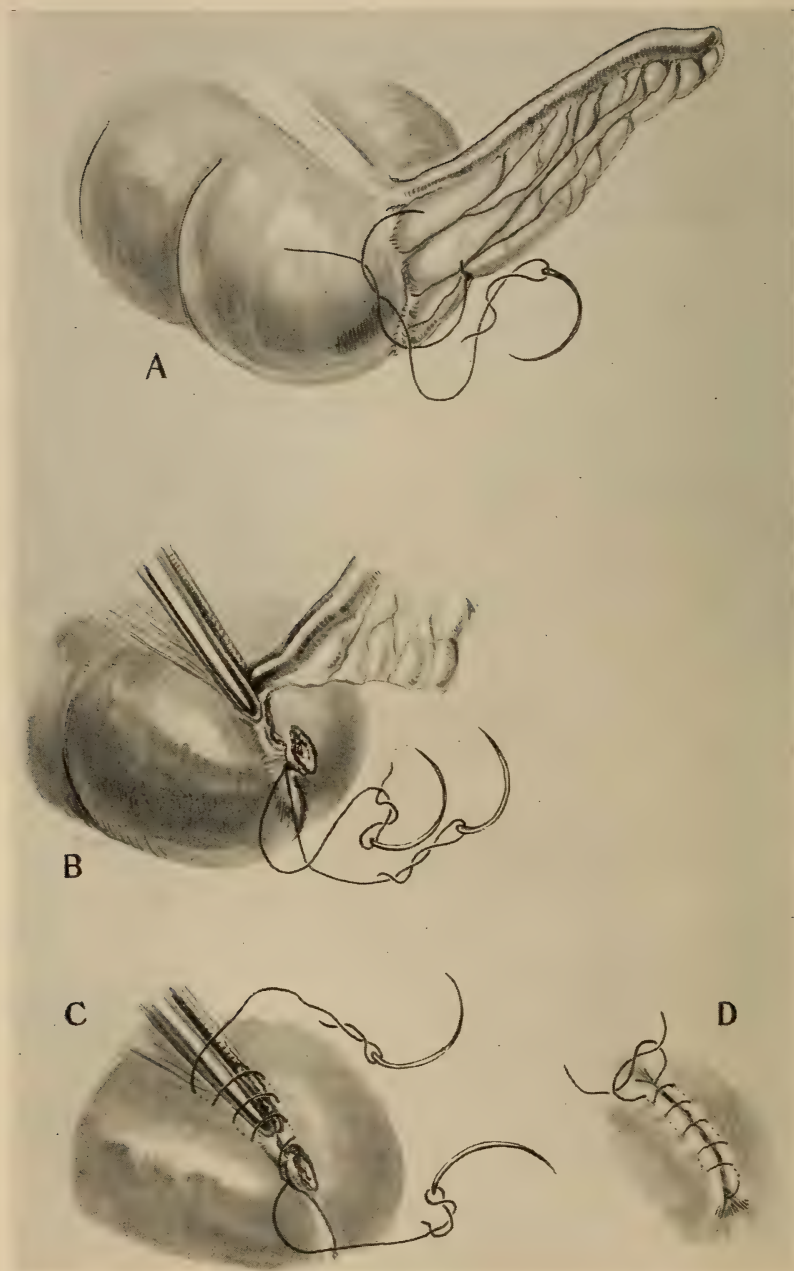


FIG. 420.—Appendicectomy. Clark's method. (A) Ligation of meso-appendix; (B) division of meso-appendix and crushing of base; the appendix is cut away close to the clamp with a cauterizing knife; (C) inversion of stump; (D) sero-serous suture.

severe and rapidly subsiding indications of acute obstruction of the intestinal tract. For a discussion of the varieties, causes, etc., of acute intestinal stasis the reader is, therefore, referred to works on abdominal surgery. The symptoms and treatment of the condition, so far, at least, as they apply to the post-operative complications of intestinal obstruction, will be found in Chapter XXXVIII.

Chronic Intestinal Stasis.—Chronic intestinal stasis frequently occurs in women. It may be the result of intrinsic pelvic disease, enteroptosis, redundancy, overdistention and angulation of certain parts of the intestinal tube, and intestinal adhesions.

Chronic Intestinal Stasis from Pelvic Diseases.—Pelvic diseases are frequently responsible for chronic stasis of the intestinal tract. The interference with the function of the bowel may be due to direct compression of the large intestine by pelvic tumors, as in the case of fibromyomata of the uterus, or by reason of pelvic exudates or adhesions that bind the intestinal loops together or to adjacent structures, and produce angulation. It is often a source of wonder to the pelvic surgeon that the distortion or compression of the intestines within the pelvis met so frequently with inflammatory lesions has not given rise to acute obstructive symptoms. Relaxation of the pelvic floor, with rectocele and impairment of the forces normally engaged in defecation, is a frequent source of chronic engorgement of the rectum and sigmoid.

Chronic Intestinal Stasis from Enteroptosis.—Enteroptosis is frequently seen

in women who have borne children, and is commonly associated with a relaxed and pendulous abdomen. In a certain proportion of cases it constitutes a developmental defect, being the result of ill nourishment during adolescence or earlier life, insufficient exercise, improper clothing, faulty habits of work, etc. Whatever the cause, the end-result in one case has certain features common to all other cases. In the normal individual the shape of the abdominal and the pelvic cavity on sagittal section is grossly triangular (Fig. 421), the base of the triangle being directed toward the diaphragm. In the erect position the posterior abdominal wall is considerably inclined forward. This furnishes a sort of shelf from which the mesenteries and retroperitoneal supports arise, and upon which the viscera find partial support. The preservation of this triangle depends largely upon the strength and tonicity of its anterior face, *viz.* the anterior abdominal wall. In individuals of poor general muscular development this may be flabby and relaxed, or it may have undergone atrophy from disuse and pressure after the individual began to wear corsets; or its strength may have become impaired by overstretching, as in pregnancy, or by the presence of

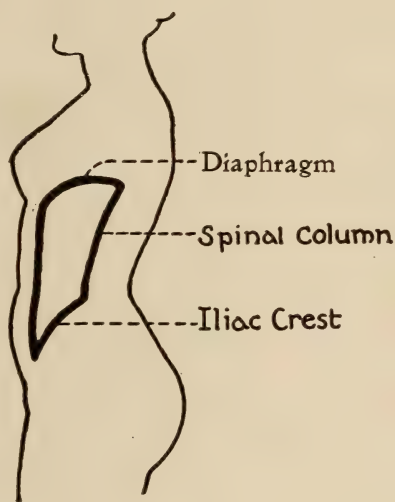


FIG. 421.—Triangular shape of the abdominal cavity on sagittal section. (After Dickinson.)

an abdominal tumor. Defects in body, form, or posture affect the inclination of the posterior abdominal wall, which becomes almost vertical. This takes away a certain amount of support from the abdominal viscera, which then display a tendency to slide downward.

Intestinal stasis from enteroptosis is less likely to occur when the ptosis affects all the abdominal viscera than when it is limited to certain parts of the intestinal tract. If all the viscera are equally ptosed, without adhesions (Fig. 422), angulation and kinking of the intestinal tube may not occur.

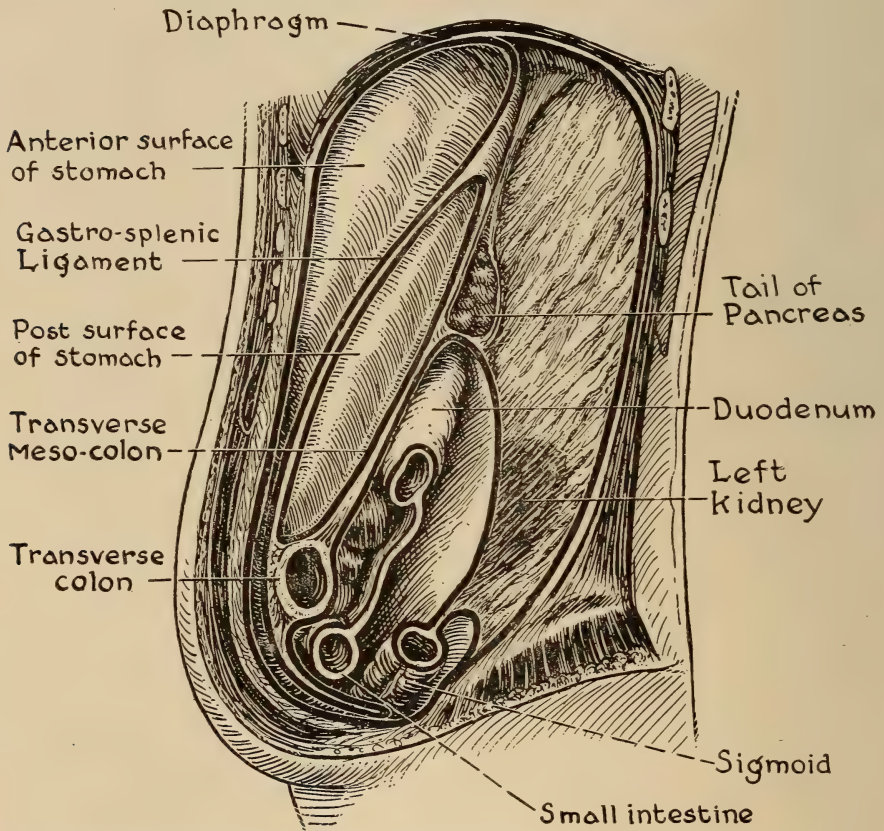


FIG. 422.—General ptosis. Sagittal section through left side of abdominal cavity showing absorption of extraperitoneal fat and the downward displacement of all abdominal organs constituting a general ptosis. The belly is pendulous, the lumbar curve is gone and the patient has assumed the "carrying position." (After Coffey.)

When only a part is ptosed, the other parts being fixed or held in their normal position, angulation and obstruction are quite the rule. The most common variety of partial enteroptosis is midline ptosis—that is, the transverse colon and the middle part of the stomach are prolapsed below their normal level (Fig. 423). The pyloric and the cardiac ends of the stomach and the duodenum, as well as the splenic flexure of the colon, remain fixed.

Partial enteroptosis may affect also the cæcum (Fig. 424) (cæcum mobile) and the ascending loop of the colon, under which conditions, par-

ticularly, obstruction may occur at the splenic flexure or at the ileocæcal junction. Partial enteroptoses are frequently associated with ptosis of the right kidney. When both kidneys are involved, all the abdominal viscera are prolapsed.

Redundancy, Kinking, and Overdistention of the Colon.—Redundancy and overdistention of the colon may result from constipation, the frequent

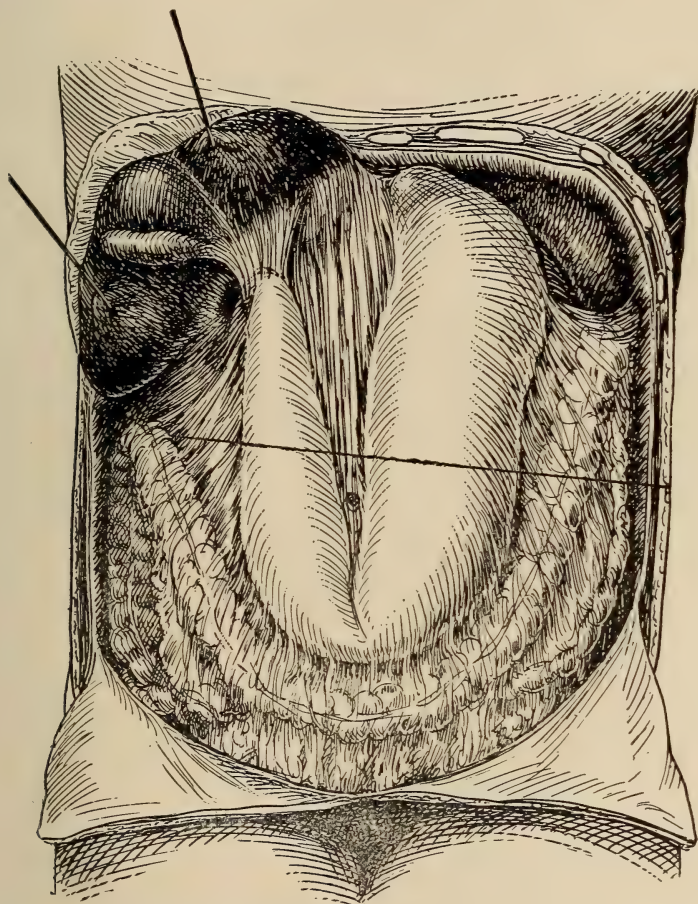


FIG. 423.—Midline ptosis. Middle pyloric portion of stomach and transverse colon prolapsed while the fixed points at the esophagus, duodenum and colonic flexures, as well as the kidneys, remain in normal position. (After Coffey.)

use of enemas, or atony of the intrinsic muscle of the intestinal coats. As seen clinically, it is often difficult to decide whether the condition of the bowel is the cause or the result of the symptoms that are present. Whatever its significance, the affected portion of the intestine is distended, its walls are thinned out and atonic, increased in length, and therefore abnormally coiled and angulated. The sigmoid is the part of the intestinal tract that is most often redundant and overdistended, but the entire colon—descending, transverse, and ascending—may be affected. In advanced cases

of intestinal stasis due to enteroptosis this is usually the case, especially if the subject has been neglectful as regards the intestinal function and is of a relaxed, asthenic habit.

Chronic Intestinal Stasis from Adhesions Between Intestinal Loops or Between the Intestinal and the Parietal Peritoneum or the Mesenteries or Omentum.—Such adhesions may be congenital or acquired, and are found in various situations:

First: About the ileocæcal junction, involving especially the terminal portion of the ileum. The adhesion may take the form of an accessory mesentery, attaching the normally free surface of the ileum to the peritoneum

of the iliac fossa or pelvis, or to the intrinsic mesentery of the ileum itself, or a band of adhesions may form between the ileum and the pelvic organs or the cæcum; or the ileum may be rolled, as it were, in its own mesentery, and be adherent there. Any of these varieties of adhesions may produce a kink or an angulation of the ileum. Attention was first drawn to them by Lane. They interfere with the proper discharge of the contents of the ileum into the cæcum, and thus are a factor in many cases of intestinal stasis.

Adhesions may also be found about the head of the cæcum and the first part of the ascending colon. These bind the intestine to the

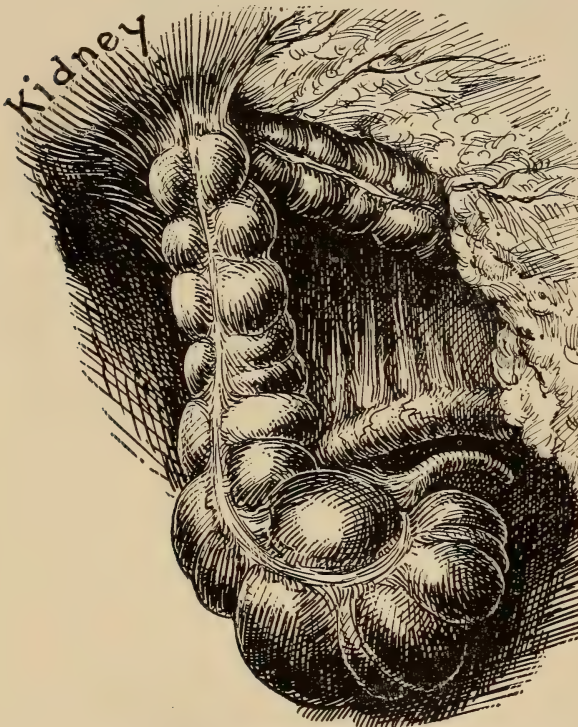


FIG. 424.—Right-sided ptosis. Unfused cæcum and ascending colon, due to incomplete rotation and fusion of colon. The colon hangs from the bottom and under border of the kidney and duodenum. (After Coffey.)

lateral and posterior parietal peritoneum or to the neighboring omentum, fixing the intestine in that position and producing stasis by interference with peristalsis or by actual kinking, especially if such adhesions coexist with midline ptosis, as is often the case.

Secondly: Adhesions not infrequently form between the loops of the sigmoid flexure. These often involve the mesosigmoid, which is folded or contracted upon itself, bringing two contiguous parts of the intestinal tube almost parallel and kinked at their junction. This is another source of obstruction to the fecal current.

The genesis of such adhesions is not always clear. They must often,

however, be congenital, and result from abnormalities in fusion and formation during embryonal life or be due to foetal peritonitis. They are also occasioned by inflammatory processes originating in the appendix (residua of an acute or chronic appendicitis), sigmoid (extension from a diverticulitis), or the intestine itself (catarrhal enteritis). Constipation may undoubtedly pro-

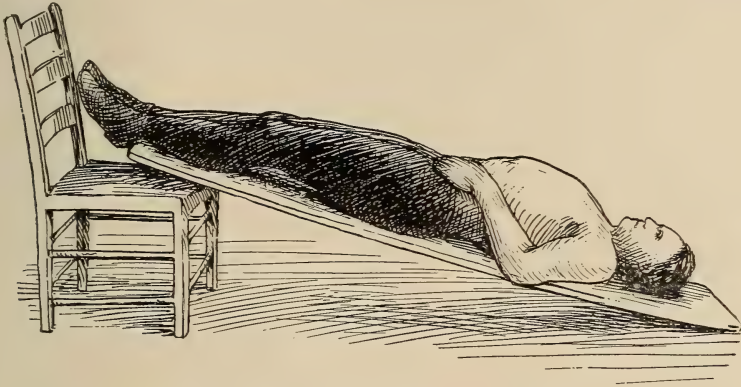


FIG. 425.—Exercises for ptotic patients. Simple means of obtaining Trendelenburg position. Position advised for exercises prescribed for ptotic patients. (After Martin.)

duce them as a secondary manifestation which is often mistaken for the primary cause.

Symptoms.—The symptoms of chronic intestinal stasis consist of chronic constipation, possibly interrupted with occasional attacks of diarrhoea, intestinal pain, gaseous distention, general digestive unrest, anorexia, coated

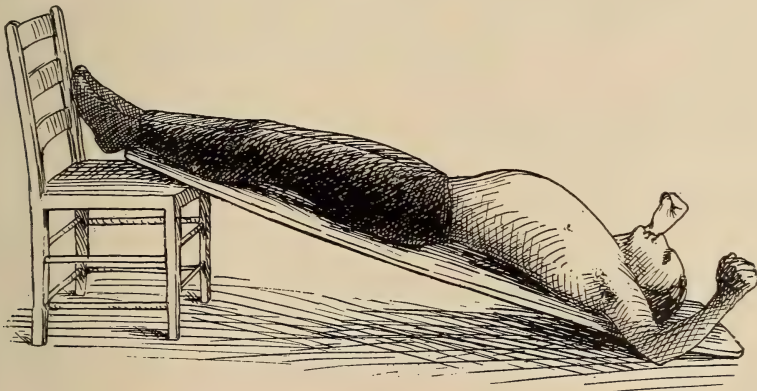


FIG. 426.—Exercises for ptotic patients. Exaggerated expansion of the chest with arms above the head. (After Martin.)

tongue, foetid breath, headache, malaise, lack of assimilation, anæmia, toxic dermatitis, etc. The severity of the symptoms usually corresponds to the degree of constipation that is present.

Diagnosis.—The degree of constipation may be estimated by the measures that are required to secure a satisfactory movement of the bowels.

Treatment.—In the treatment of intestinal stasis conservative measures should invariably be exhausted before surgical aid is sought. When, however, the cause is evidently an organic lesion that will not yield to palliative measures, operative intervention should be undertaken. To be specific: if pelvic inflammatory disease, a pelvic tumor, or a chronically diseased appendix is present, the seat of the disease may be removed at once. In enteroptosis, however, either with or without adhesions, the best that surgery can offer is not always easy to determine, and it is well, therefore, to hold this form of treatment in reserve.

Even with the help of the Röntgen ray one is often unable to predict what surgery can accomplish. In spite of anything the Röntgen ray may show, therefore, in the way of ptosis, kinks, obstruction, etc., one should first learn the

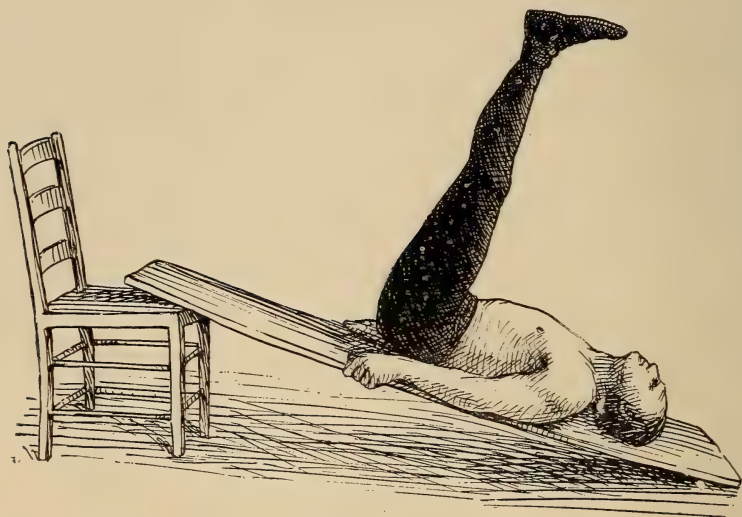


FIG. 427.—Exercises for ptotic patients. After extreme extension of the legs, one at a time and then together, leg is flexed upon thigh and thigh upon abdomen, followed by return to extended horizontal position. (After Martin.)

effect of non-operative measures that aim to restore the ptosed organs to their normal position. This last is best accomplished by postural treatment; when the trunk is inclined toward the diaphragm (Trendelenburg position, knee-chest, or Sims' position), the abdominal viscera gravitate in that direction. Even when the erect posture is resumed the restoration may be maintained, at least for a time, by properly supporting the anterior abdominal wall.

The postural treatment may be combined with exercise that tends to strengthen the anterior abdominal muscles (Figs. 425, 426, and 427). The anterior abdominal wall is best supported by means of a corset.

The frequency and power of the intestinal movements may be influenced, first of all, by a diet that leaves a large residue in the intestine, lubricates the intestinal lining, or stimulates the production of the normal peristaltic-persuading juice (bile). The bulky vegetables and cereals, such as potatoes,

baked or mashed, spinach, cabbage, turnips, parsnips, beets, oatmeal and cream, mush and cream, etc., are useful for this purpose. Fat meat, prunes, figs, dates, and baked apples are also helpful. The articles of diet that should be taken sparingly are those that are almost entirely digested in the intestinal tract, such as milk, eggs, lean beef or mutton, etc. In addition to regulating the diet, exercise is of paramount importance; besides the postural exercises mentioned, walking, tennis, golf, dancing, with the abdominal wall well supported, if not carried to the point of fatigue, may be of some value. Massage of the abdominal wall has a distinct field of usefulness.

The establishment of the habit of going to stool at a definite hour, when there is plenty of time, and making an effort to defecate, whether the impulse is present or not, are helpful. Immediate relief cannot be expected from any of these measures or from a combination of them but, except in the worst cases, persistence will bring success. Until successful results are secured, and especially if improvement is slow, laxatives of some sort must be prescribed. Of these the most satisfactory is a combination of cascara (2 grains), rhubarb (1 grain), licorice (1 grain), and podophyllin (1/24 grain). Other formulas are as follows:

R Aloini	gr. 1/5
Strychninæ	gr. 1/120
Ext. belladonnæ fol.	gr. 1/8
Ext. rhamnus purshianæ	gr. 1/2

One or two such pills to be taken at night.

or

R Fl. ext. rhamnus pursh.	
Fl. ext. rhei	℥i
Fl. ext. sennæ	℥ii

M et Sig.: One to two fluidrams at night.

These remedies may be administered in decreasing dose as the case progresses, and finally, if possible, discontinued. In making a selection of the particular formula, it is well to bear the idiosyncrasies and preferences of the patient in mind. Of late much use has been made of chemically pure paraffine oil. This is a tasteless and odorless intestinal lubricant. It is marketed under various trade names. When this oil is exhibited (1 to 4 drams thrice daily), the patients acquire, in the course of a few days, a feeling of insecurity as regards the restraining power of the sphincter ani, and may be inclined to discontinue the remedy. A little encouragement, careful regulation of the dose, and the assurance that this feeling will disappear or be under control within a short time will serve to restore the patient's confidence. The patient sometimes prefers to take a single large dose at bed-time (4 to 8 fluid drams). As the oil is a lubricant only, it is often advantageous to combine with it a laxative such as the fluidextract of cascara (10 to 60 drops).

If anything more is required, suppositories and enemas may be employed, the latter being the most satisfactory. Either hot water and Castile soap, or the combinations mentioned under post-operative treatment (page 665), may

be used. Gluten or glycerin suppositories may serve to supply the impetus for evacuation.

Injections of paraffine oil are occasionally successful. About four to eight ounces of the warmed oil should be injected slowly through a large catheter passed high into the bowel, the patient lying on her left side with the hips elevated. After fifteen minutes in this position the patient may turn upon her back, the hips still being kept elevated. The patient should sleep upon the right side, with the hips higher than the trunk. The quantity of oil given should not be large enough to induce violent peristalsis. Oil administered in this

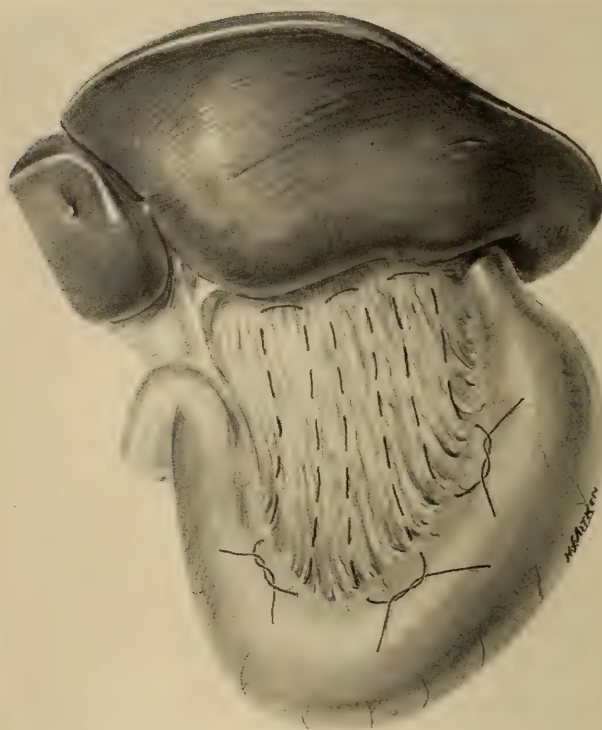


FIG. 428.—Beyea's operation. Suturing of the gastrohepatic omentum.

way upon retiring will sometimes secure a satisfactory stool the following morning.

Granulated agar-agar (vegetable gelatin), taken with a cereal in the morning, is often of much benefit in softening the fæces and lubricating the intestinal mucosa.

For emaciated patients Coffey advocates the rest cure, with forced feeding and the frequent assumption of the "elevated hips" position. In this way he seeks to deposit fat within the leaves of the lean and overstretched mesenteries, with a consequent shortening and increase in tone. Under such a plan he has in a number of cases improved the position of the abdom-

inal viscera, and recommends that this method be used before resorting to surgical treatment.

The **surgical** treatment of intestinal stasis may consist of any one or any combination of two or more of the following operations:

1. Elevation of the stomach (gastropexy).
2. Suspension of the colon (colopexy).
3. Division of adhesions.
4. Intestinal anastomosis and short circuiting.
5. Resection of the intestine.
6. Contraction or expansion of the abdominal parietes.

The particular operation or operations chosen will depend on the nature and number of the lesions revealed by an exploratory incision. The Röntgen ray

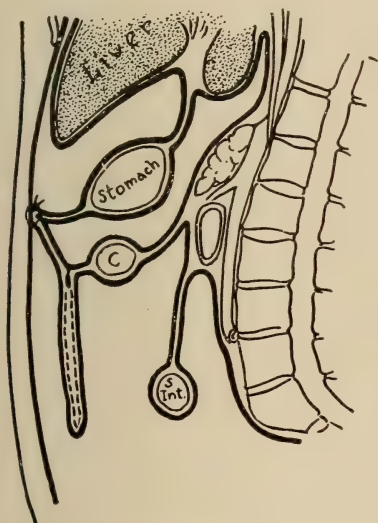


FIG. 429.—Gastropexy; Coffey's operation. The omentum is sutured to the anterior abdominal wall. (After Coffey.)

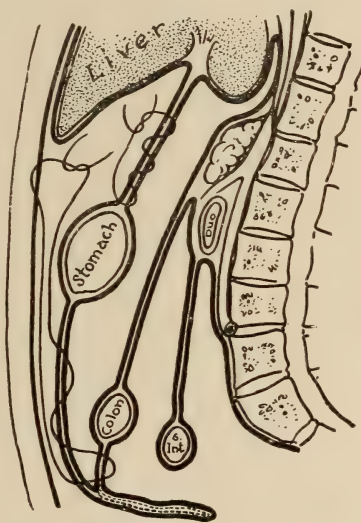


FIG. 430.—Diagram illustrating the placing of the sutures for shortening the gastrohepatic omentum, Beyea's operation, and for suturing of great omentum to the anterior abdominal wall, Coffey's operation. (After Coffey.)

will often furnish accurate knowledge of the lesions before operating. Nevertheless, the interpretation of the Röntgen ray is not free from error, and its findings should be verified or confirmed by making an examination after the abdomen is open.

1. *Gastropexy*.—The stomach participates in midline ptoses. Although the dropping of the stomach below its normal level does not produce intestinal stasis, if it is giving rise to symptoms as an associated condition, such as gastric retention, etc., it requires correction. The best type of operation is that devised by Beyea, which consists in shortening the gastrohepatic ligament. The technic of the operation may be learned from the accompanying illustrations (Figs. 428, 430, and 431).

2. *Colopexy*.—Midline ptosis of the colon with angulation at the splenic flexure, or at both the hepatic and the splenic flexure, may be corrected by

the operation of Coffey, which attaches the gastrocolic and the upper areas of the great omentum to the anterior abdominal parietes (see the accompanying illustrations, Figs. 429, 430, and 431).

Ptosis of the ascending colon or of the cæcum (cæcum mobile) may be treated by the operation of Wilms, as practised by Frazier. He makes a vertical incision in the parietal peritoneum about one inch from the peritoneal reflexion on the outer side of the cæcum. A pocket is made for the cæcum by dissecting the peritoneum off a distance of an inch above and below the line of incision. The cæcum is then secured in place by a continuous suture of linen introduced through the margin of the peritoneal incision above described, and the longitudinal band of the cæcum.

Ptosis of the sigmoid flexure may be treated after the plan of Murphy. For this operation an incision is made through the outer margin of the left rectus. The sigmoid and the rectum are drawn up as high as they will go

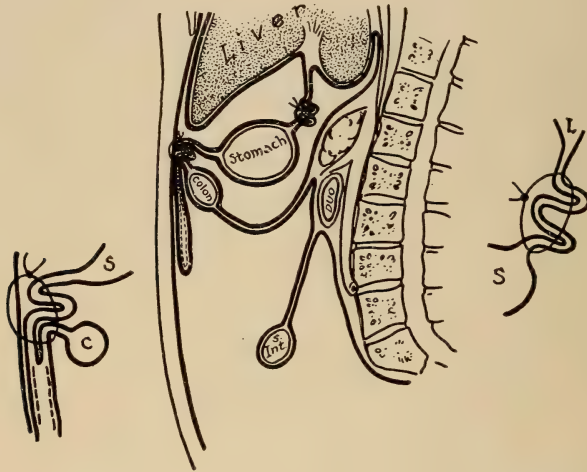


FIG. 431.—Scheme of completed Beyea and "hammock" operation.
(After Coffey.)

with moderate traction. The peritoneum of the posterior abdominal wall is then divided above the pelvic brim and the outer side of the ureter for a distance of four to five inches. A flap of peritoneum is next freed from its posterior attachments in a direction outward from this incision. The sigmoid is rolled into the raw, denuded area, and is secured to the muscles behind the peritoneum by means of a continuous catgut suture. The peritoneal flap is folded medianward around the sigmoid, and accurately sutured to it near the mesosigmoid. The under surface of the peritoneum becomes fixed, and the sigmoid, in turn, becomes permanently adherent to the retroperitoneal muscles and aponeurosis (Fig. 433).

3. *Division of Adhesions.*—Pericolic adhesions should not be interfered with unless they give rise to obstruction by anchoring the cæcum too high or too low. If this is the case, they should be divided and the raw surfaces peritonealized or protected as far as possible.

Adhesions and supernumerary mesenteries about the lower ileum caus-

ing Lane kinks should be divided, and the raw surfaces so disposed as to prevent their reformation and yet release the bowel.

Adhesions between the loops of the sigmoid flexure may be prevented from reforming by performing suspension after Murphy's plan, or if the bowel is exceedingly redundant, the denuded part of the intestines may be resected.

Adhesions between loops of the small bowel should not be interfered with if there is no angulation; if they cause a kink or an angulation, they

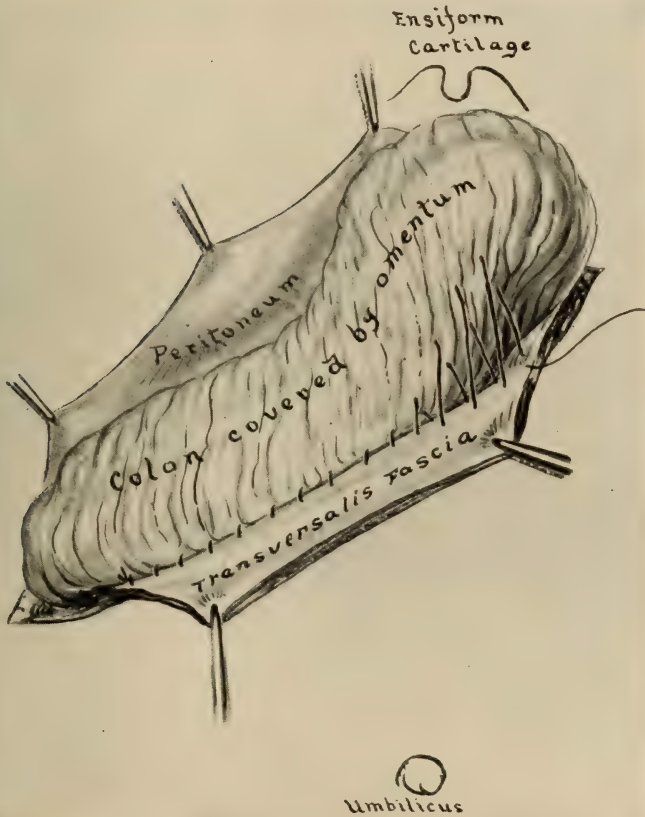


FIG. 432.—Suspension of the hepatic flexure, Reed's method. The colon covered by the base of the omentum is being attached to the everted transversalis fascia.

should be freed and the raw surfaces protected (see pages 641 and 643). If the released bowel is in bad condition, resection may be performed.

The release of post-operative adhesions between the omentum and the lower abdominal wall or appendicular or pelvic region may at once dispose of a ptosis of the stomach or colon entirely due to traction. If, however, the colon and stomach are in their normal position and the adhesions of the omentum are high attaching the colon to the abdominal parietes, they may often, with advantage, be disregarded.

After the release of adhesions in any part of the abdomen the posture of the patient should be such as to insure the retention of the viscera in or above their normal position, or nearly so. For this purpose the foot of the bed should be slightly elevated, and the patient encouraged to turn from side to side; if adhesions then reform, the obstructive symptoms will not necessarily recur. It is also wise to stimulate peristalsis by the exhibition of pituitrin and the early administration of a laxative.

4. *Intestinal Anastomosis and Short Circuiting*.—An area of obstruction



FIG. 433.—Suspension of sigmoid (after Murphy, from Kelly and Noble); (bbb) shows elevation of retroperitoneal flap and subperitoneal suture line to sigmoid. (Courtesy W. B. Saunders Co.)

in the intestinal tract may be excluded by anastomosing a point above to a point below the obstructed area. This method is known as short circuiting. Aside from obstruction due to new growths, which is not pertinent to this discussion, such an anastomosis is most frequently made between the terminal part of the ileum and the sigmoid flexure. This excludes the ileocaecal junction, hepatic and splenic flexure, and with them the obstruction to the fecal current so frequently observed in those localities. Technically, the operation is a simple one. As experience accumulates, the frequency of backflow and accumulation of faeces in the excluded area will

be determined. Upon this depends the ultimate place in surgery of the short-circuiting operation.

5. *Resection of the Intestine*.—Resection of the intestine may be indicated by: (1) Extensive tearing of the intestine after separation of adhesions.

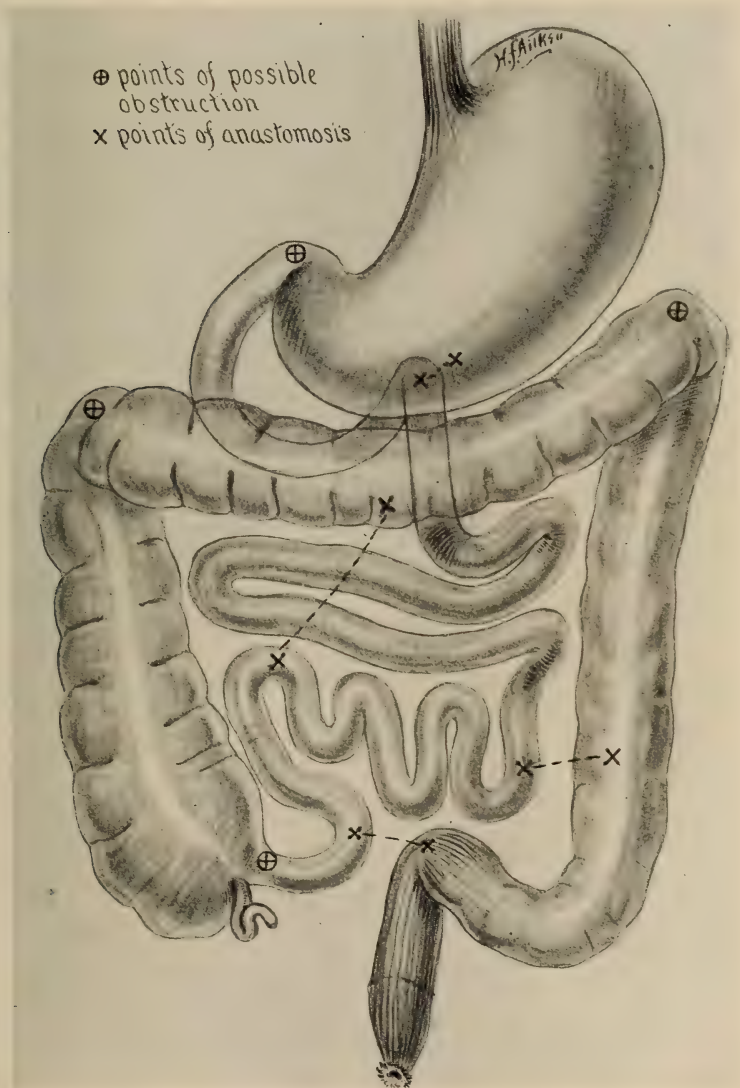


FIG. 434.—Points of anastomosis and obstruction in the gastro-intestinal tract.

(2) Redundancy, dilatation, and an unhealthy condition of the bowel.

Resection may be applied to the ileum, the ileum and cæcum, the sigmoid and the ilium and the entire lower colon as far as the sigmoid flexure.

In the most extensive form, resection of the bowel for intestinal stasis

rids the patient of intestine that cannot be placed in a normal position, of intestine that is almost certain to become adherent and cause obstruction, or of intestine that is so badly damaged or so distended, elongated, ptosed, and atonic, that it will probably never functionate properly.

This is often a serious operation. The form most commonly applicable is resection of the terminal ileum, cæcum, and ascending and part of the transverse colon. The proximal end of the ileum is then anastomosed with the transverse colon.

6. *Contraction or Expansion of the Abdominal Parietes.*—Although Coffey has devised operations for the purpose of expanding the upper and contracting the lower abdomen, they are so difficult to execute successfully as to be rarely of practical use. Expansion of the upper abdomen is best secured by the adoption of postural methods combined with exercises that tend to develop the lower thorax. When relaxation of the lower abdomen is largely featured by diastasis of the rectus muscles, a reduplication of the overstretched fascia between them after the plan of Webster, gives excellent results. In these cases we need not, however, rely on surgery alone to support the abdominal wall, for the median overlapping of fascia and the excision of redundant fat may be satisfactorily augmented by the application of a suitable corset or an abdominal bandage.

DIVERTICULITIS

Etiology.—Inflammation of diverticula of the mucosa of the intestine affects principally the sigmoid. Meckel's diverticulum of the lower end of the ileum also may be the seat of a diverticulitis. It is a rarely recognized condition, but is more common than is generally believed. Small pockets of the mucosa are formed which penetrate the wall of the gut, following the course of the veins. The diverticulum may end beneath the serous coat or pass further into an epiploic appendage, or it may not go beyond the muscular coat. The condition is usually multiple.

The diverticula may be congenital or acquired (as from constipation). They are, generally, for a time, the seat of a subacute or chronic inflammatory process. This finally results in either a gradually formed hypertrophy of the intestine in the area of the diverticulum resembling a new growth, or the inflammatory process may extend to the peritoneal surface or into an epiploic appendage and produce a sharp attack of pelvic peritonitis or epiploitis.

Symptoms.—The symptoms are usually slow in origin, and extend over a long period of time. There is a tendency toward diarrhœa, blood and mucus appearing in the stools, and pain is present. When, conjoined with these symptoms, a mass develops in the left iliac region, the suggestion of malignancy is very strong, and nothing but an exploratory operation, or even a laboratory examination of the removed section of the bowel, will show the process to be entirely inflammatory and not malignant. If the process suddenly becomes acute, the symptoms strongly resemble those of an appendicitis, except that the pain, rigidity, and tenderness are on the left side.

Treatment.—In the chronic forms, with tumor formation, the diseased area should be resected.

In acute cases the affected epiploic appendage should be removed, the communication with the bowel closed, and drainage provided, if necessary.

BIBLIOGRAPHY

- BEYEA, H. D.: "The Elevation of the Stomach in Gastropotosis by the Surgical Plication of the Gastrohepatic and Gastrophrenic Ligaments." *Phila. Med. Jour.*, 1903.
- CLARK, J. G.: "Anatomical Considerations in Peritoneal Adhesions." *Trans. Amer. Gyn. Soc.*, 1909, 401; *Ibid.*: "The Surgical Consideration of Congenital and Developmental Defects Leading to Obstinate Constipation." *Jour. Amer. Med. Asso.*, August 16, 1910, 1v, 449.
- COFFEY, R. C.: "The Principles Underlying the Surgical Treatment of Gastro-intestinal Stasis, Due to Causes Other Than Structural or Ulcerative Conditions." *Surg., Gyn. and Obst.*, 1912, xv, 365; *Ibid.*: "The Significance of the Fixation of Certain Abdominal Organs in the Human Body." *Trans. Sect. Obst., Gyn. and Abdom. Surg., A. M. A.*, 1915, 205.
- EASTMAN, J. R.: "Colon Stasis." *Trans. Sect. Obst., Gyn. and Abd. Surg., A. M. A.*, 1914, 78.
- FRAZIER, CHAS. H.: "The Recognition and Treatment of Lesions of the Right Iliac Fossa, Other than Appendicitis." *Annals of Surgery*, October, 1912.
- HORSLEY, J. S.: "Surgical Treatment of Intestinal Stasis." *Trans. Sect. Obst., Gyn. and Abd. Surg., A. M. A.*, 1917, 228.
- LATHROP, W.: "Lipectomy and Umbilical Hernia." *Trans. Sect. Obst., Gyn. and Abd. Surg., A. M. A.*, 1916, 263.
- MARTIN, F. H.: "Gymnastics and Other Mechanical Means in the Treatment of Visceral Prolapse and Its Complications." *Trans. Amer. Gyn. Soc.*, 1912, xxxvii, 133.
- MAYO, WM. J.: "Diverticulitis of the Large Intestine." *Trans. O., G. and A. S., J. A. M. A.*, 1917, p. 216.
- MURPHY, J. B.: *Intestinal Surgery*. Kelly-Noble, ii, xxxiv. Saunders, Phila., 1907.
- REED, C. A. L.: "The Redundant Sigmoid." *Trans. Sect. Obst., Gyn. and Abd. Surg., A. M. A.*, 1914, 103; *Ibid.*: "Treatment of Constipation." *Trans. Sect. Obst., Gyn. and Abd. Surg., A. M. A.*, 1916, 143; *Ibid.*: "Physiologic Colectomy." *Trans. Sect. Obst., Gyn. and Abd. Surg., A. M. A.*, 1917, 290.
- SMITH, R. R.: "Enteroptosis." *Surg., Gyn. and Obst.*, 1906, iii, 130.
- TUTTLE, J. P.: "Relationship Between Rectal Disease and Those of the Female Pelvic Organs." *Amer. Jour. Obst.*, lxi, 784.

CHAPTER XXVII

DISEASES OF THE ANUS AND RECTUM

FISSURE IN ANO

ANAL fissure is a crack or a linear ulcer of the mucous membrane on the margin of or within the sphincter ani muscle. It is produced by chronic constipation with straining at stool, and the passage of hard, scybalous masses that lacerate or abrade the mucous membrane. Small particles of fecal matter lodge in these abrasions or cracks, and are retained there for a time by reason of the infrequent action of the bowels. The sphincter muscles become irritated and spastic, so that they grasp the mucosa closely and further enclose the particles of foreign matter. Sooner or later the small abrasion or crack becomes a linear ulcer, which shows no tendency to heal. Since, by reason of the spastic sphincter, the walls are kept constantly in contact, there is no drainage and the condition progresses from bad to worse. The base of the fissure may become inflamed, and infiltration and induration of the parts beneath and on each side of it may take place. The ulcer may be small and linear and entirely concealed by the folds of the anal mucosa, or it may be larger and of an oval shape, so as plainly to be visible when the anus is exposed. Ulcers that are inflamed and have their seat upon an inflammatory base are particularly evident upon inspection.

Fissure in ano is at times associated with a single mucocutaneous hemorrhoid, the latter probably being secondary to the former and caused by local blockage of the venous trunks by inflammatory products. The condition is predisposed to by dryness of the anal mucosa, and may exist in association with eczema of the anus.

Although, as a rule, the ulcer is single, more than one may be present, but one is always more pronounced than the others.

Symptoms.—The symptom characteristic of fissure in ano is pain during and after defecation. During defecation the anal folds are partially smoothed out by the passage of the fecal mass, the surface of the ulcer is irritated, and the patient complains of pain. Pain is most severe after defecation, when the sphincter contracts, holding the base of the ulcer tightly within its grasp, and compressing the recently irritated surface, covered with particles of fecal matter; or the base of the ulcer may have been torn afresh during defecation. The stools often contain blood, and at times a thin, highly irritating discharge takes place from the anus, giving rise to intense itching—*pruritus ani*. The patient is usually constipated, and makes little effort to move the bowels systematically, avoiding the painful ordeal as long as possible.

Diagnosis.—Pain during, but particularly just after, defecation, associated with bloody stools and constipation, is the symptom-complex strongly diagnostic of fissure. The latter may be detected at once on slightly separating the edges of the anus, or it can often be felt by the finger as a local-

ized point of induration and tenderness. A speculum may be introduced and the suspected area exposed. In some cases, however, the patient is so apprehensive, the sphincter is so tight, and examination causes so much pain, that the symptoms alone will justify the use of a general anæsthetic for a confirmation of the diagnosis, the treatment being carried out at the same time.

Treatment.—The essential features of all methods of treatment are to clean the surface of the ulcer and to reduce or obviate the action of the sphincter. In mild cases the best results are obtained by cleansing the ulcer and the anal mucosa and keeping them clean, cauterizing the base of the ulcer, and overcoming the spasticity of the sphincter by performing gradual dilatation and by the application of a soothing ointment. Thus the fissure may be exposed through a speculum and thoroughly cauterized. A daily saline laxative should be prescribed and the patient instructed to wash the lower bowel thoroughly with repeated flushing of salt solution in the morning after the bowels have moved. A sedative and astringent ointment, such as equal parts of unguentum gallæ (U.S.P.) and unguentum stramonii (U.S.P.), should be applied by means of the forefinger, protected with a rubber finger-cot, the entire anal surface, external and internal, being gone over. The finger should be passed gently through both sphincters, using a boring motion. A daily treatment of this sort keeps the ulcer clean, lessens irritability of the sphincter, and hastens a cure. The patient should be instructed to use a soft washcloth or wet toilet paper after a bowel movement. When the case is of a severe type, the tenderness being marked, the sphincter very tight, or the ulcer old and indurated, an anæsthetic must be given and the sphincter either thoroughly divulsed or incised.

Divulsion of the sphincter should be performed slowly, so as to overstretch but not to rupture the muscle-fibers. The finger-tips of one hand should be so approximated as to form a cone, which should be well lubricated with sterile vaseline and inserted into the anus with a boring motion. This should be repeated until the muscle yields and sufficient dilatation has been secured to admit three fingers, one alongside of the other, without resistance. The muscle may also be stretched by inserting the forefinger or the thumb of each hand in the anus and gently pulling in opposite directions. Rough or forcible stretching of the sphincter may result in subcutaneous rupture, hæmatoma formation, and, rarely, in permanent incompetency of the sphincter.

Operation for Fissure In Ano.—Divulsion of the sphincter alone will suffice for the cure of mild cases of anal fissure. If, however, the ulcer is of considerable size and depth, or if induration is marked, it should be thoroughly curetted, overhanging edges should be cut away, and the base should be touched lightly with pure phenol and alcohol.

When the ulcer has become so chronic, or the case has proved so resistant to previous treatment, that division of the sphincter and total suspension of its function for a time are regarded as necessary, then the sphincter muscle may be divided completely. The line of division should run through the base of the ulcer, at right angles to the muscle-fibers. The sphincter should always be divided at right angles.

FISTULA IN ANO

Fistula in ano is a false passage or sinus between two or more of the following parts: The lower rectum, the anus, the perianal skin, and the cellular tissue of the ischiorectal fossæ. The most common type takes the form of a fistulous channel between the anus and the perianal skin, the fistula beginning about the junction of the anus and rectum, passing externally to the sphincter muscles, through the cellular tissue of the ischiorectal fossæ immediately alongside of the rectum, and opening on the skin surface surrounding the anal orifice. A blind anal fistula is a tract running between the ischiorectal fossæ and the lower rectum or anus. The two varieties just described undergo many modifications, as regards both their relations to the anatomic parts involved and their extent.

Fistula in ano has its origin in an abscess or a focus of suppuration in the cellular tissue surrounding the anus or lower rectum. Commonly an abrasion or injury of the lower rectum or anus produces, by lymphatic absorption, a suppurative focus in the cellular tissue. This burrows its way outward and finally discharges externally about the margins of the anus. The formation of the abscess and its rupture may be accompanied by violent or by barely noticeable manifestations. In other words, the patient presents the symptoms of an acute ischiorectal abscess, or all that may be remembered afterward is that a "boil" or some trivial inflammatory mass was present. Tuberculosis is believed to play an important rôle in the production of fistula in ano. A tuberculous erosion takes place in the lower rectum, which leads to infection of the neighboring cellular tissue, the tuberculous area breaks down, becomes secondarily infected, perhaps, with one of the varieties of intestinal bacteria, and then discharges externally or into the bowel, or in both directions, as the case may be. Before the pus or tuberculous products find an exit the inflammatory process may have extended in various directions, following planes of fascia or cellular tissue. Occasionally the most extensive undermining and ramification of the inflammatory process take place before the external opening is formed.

Of the influence of syphilis in the production of fistula, little positive information is available. Nearly all the cases of fistula attributed to syphilis have been secondary to stricture of the rectum. In such cases the fistula is usually a complicated or complex one, due to perforation of the rectal wall by ulcerative processes and the subsequent infection of the perirectal tissues. The fistula, therefore, becomes one of simple infection, and not of a specific nature itself. The extent of the influence of syphilis in the production of fistula is as yet undetermined, but there is no doubt as to the effect it has in delaying healing after operation.

Because of the imperfect drainage that the external opening usually affords, or owing to the continuous entrance of gas or fæces from the bowel, or as a consequence of tuberculous or syphilitic processes in the areas affected, fistula in ano shows but little tendency to undergo spontaneous cure. The inflammatory process along the line of the fistula may, therefore, continue gradually to extend, burrowing in one or more directions.

Symptoms.—The most prominent symptom of a fistula in ano is an involuntary discharge of gas or liquid feces and pus through the external opening. In the case of a blind internal fistula this does not, of course, occur. Other symptoms are repeated attacks of pain, swelling, and tenderness in the affected regions, followed by the discharge of pus externally or from the bowel, and the subsidence of symptoms. Between these exacerbations the patient may be quite comfortable, the only manifestation being a constant moisture about the anus, or a feeling of weight or heaviness in the perineum, with painful defecation and the presence of blood and pus in the stools.

Diagnosis.—The external opening of a fistula is usually readily discerned, but it may be so small as to be demonstrable as an opening only by the passage of a fine probe. As a rule, a discolored spot or indurated elevated area marks the site of the opening. The site of the internal opening can often be detected by the induration surrounding it, but the only proof is the passage of a probe entirely through the fistulous tract. The internal orifice of a blind fistula may be exposed by means of a rectal speculum and a small laryngoscopic mirror.

When the existence of a blind internal fistula is suspected, even though no internal opening can be felt or seen, the anal and the rectal crypts should gently but systematically be examined with a fine probe. In this way small fistulae may be discovered that would otherwise escape detection.

Treatment.—An effort at cure may be made by insuring daily evacuation of the bowels, irrigation, gradual dilatation of the sphincter, and repeated and systematic cleansing of the fistulous tract, but, as a rule, recourse must be had to operation.

The oldest method of operative intervention was to thread the fistulous tract upon a grooved director, bring the extremity of the director through the anus, and divide the overlying tissues, cutting the sphincter as it lay in the path of the knife. The fistulous tract, laid bare, was then thoroughly curetted, cauterized with pure phenol and alcohol, and allowed to heal by granulation. At the present time such a method should be reserved only for the worst cases, *i.e.*, those in which the undermining and burrowing have been so extensive that copious drainage is the prime object of the operation.

The ideal method in the majority of cases is excision of the fistulous tract, followed by immediate closure of the wound (see Fig. 435). This is usually feasible with suitable preparatory treatment of the fistulous tract. The treatment consists of dilatation of the external opening to secure free drainage, daily irrigation and thorough cleansing, and the application or injection of antiseptic solutions (iodine, 5 per cent.; ichthyol, 10 to 25 per cent., etc.).

Just before the operation is begun, the fistula should be thoroughly cleansed and disinfected with hydrogen peroxide and tincture of iodine. The sinus is threaded upon a silver probe and the entire tract extirpated from the surrounding healthy tissue (Fig. 435). It may be necessary to divide the sphincter, but this may be done with impunity at right angles to the fibers. The wound after excision may at once be repaired with catgut sutures. If the sphincter has been divided, the ends must be approximated by two special sutures of fine chromic gut.

When there are several or many ramifications of the fistula, all running in the same general direction, and if the tracts may be excised without great loss of tissue, a single division of the sphincter may be sufficient, and immediate repair may be successfully carried out. If the wound is very

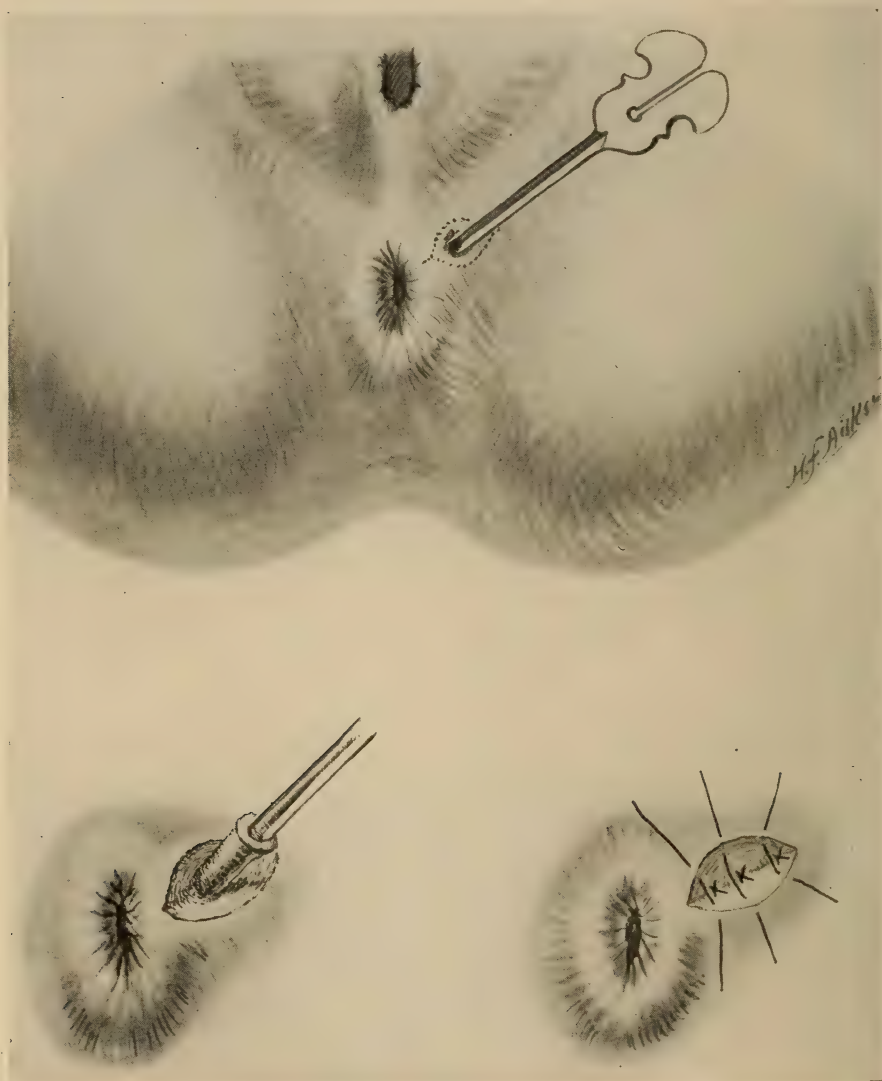


FIG. 435.—Excision of fistula in ano.

extensive and it is evident that healing must take place by granulation, the incision in the rectal wall and mucosa and in the sphincter may be closed, and free drainage provided externally. Care should be taken, however, to stretch the muscle thoroughly, otherwise its contraction may interfere with the healing of the wound.

PRURITUS ANI

Pruritus about the anus may be produced by an irritating discharge from the bladder, vagina, or rectum, as in diabetes, leucorrhœa, fissure, fistula, proctitis, or rectal neoplasm. It may also be caused by eczema or other skin diseases affecting the anal mucosa and integument. Intestinal parasites (pin-worms), constipation, gout, nervousness, and habit may be factors in its production. It is prone to occur in stout, full-blooded, well-nourished women.

Symptoms.—Intense itching, with an almost uncontrollable desire to scratch, is the chief symptom. The itching is most intense at night. The bowels are usually constipated. If fissure, fistula, or hemorrhoids coexist, blood and mucus appear in the stools.

Diagnosis.—Since pruritus is but a symptom of several diseases, it has no subjective diagnostic signs of its own.

Pruritus ani deserves individual consideration only when no gross lesion can be found to explain it. In these cases the cause is probably neurotic, and the local manifestations are more often the effect of the scratching than the cause of the itching. It may, of course, be quite impossible to distinguish between the two.

The skin usually appears thickened, excoriated, and broken here and there by scratch marks; the surface is either dry and scaly or moist and foetid.

Treatment.—The aim of the treatment is the cure or alleviation of the underlying provocative cause. What has been said relative to pruritus vulvæ is applicable here (see Chapter XI, page 170).

HEMORRHOIDS

Hemorrhoids are vascular tumors composed of dilated veins of the hemorrhoidal plexus, surrounded by the overstretched and hypertrophied mucous membrane or skin of the lower rectum and anus. In women they may be due to the congestion of the hemorrhoidal plexus that takes place in those who follow sedentary occupations and suffer from constipation. The pressure of the child's head in the later months of pregnancy is another factor, whereas the distortion and injury to the lower rectum and anus incident to labor almost invariably aggravate the tendency. Relaxation of the vaginal outlet and the pelvic floor is frequently accompanied by hemorrhoids.

According to their location, hemorrhoids are designated as external when they protrude from the margin of the anus, and as internal when they lie within the grasp of or above the external sphincter and appear only on straining. They may be covered entirely by mucous membrane. Usually they are situated at the junction of the mucous membrane and skin, so that toward the lumen of the rectum they are covered by mucous membrane, whereas toward the perianal region the covering is cutaneous.

Symptoms.—The symptoms of hemorrhoids are pain and bleeding after defecation, and a feeling of weight and protrusion about the anus. There may be considerable itching. Other symptoms dependent upon complica-

tions at times occur, the most common of which are thrombosis and inflammation of the hemorrhoidal masses.

A *thrombotic* hemorrhoid is tense and painful, and generally protrudes from the anus, so that its pedicle or base lies within the grasp of the sphincter. In addition to the constant pain and tenderness of the swollen hemorrhoidal tumor there are severe pain on defecation and painful spasm of the sphincter muscle. Thrombosis may affect one or the entire group of hemorrhoids. The attack subsides in from three to ten days, the clot softening and tension being relieved. The hemorrhoid may remain somewhat enlarged. Occasionally the clot may not be entirely absorbed, but may remain as a small, hard thrombus or vein stone.

A hemorrhoid may also become *infected* and *inflamed*. These complications are often associated with fissure or fistula. The tumor becomes slightly enlarged, may be more or less surrounded by inflammatory infiltrate, and is tender and painful.

Diagnosis.—Cutaneous and mucocutaneous hemorrhoids are readily diagnosed by simple inspection while the patient is told to bear down. Hemorrhoids within the sphincter are visible often only after evacuation of the lower bowel and the introduction of a short proctoscope, or they may be made to protrude by having the patient assume a squatting position, bear down, and strain over a vessel of hot water. A thrombotic hemorrhoid is tense, hard, exquisitely tender, and bluish in color. Thrombotic and inflamed hemorrhoids can be felt as well as seen, but an internal hemorrhoid that is neither thrombosed nor inflamed may escape recognition by the palpating finger.

Treatment.—The cure of hemorrhoids is best and most surely accomplished by operation. Some cases of moderate or mild degree may be rendered comfortable by non-operative methods of treatment. These include the administration of a daily laxative, irrigation of the lower bowel with salt solution, the use of the bidet, cold water enemas, and the exhibition of an astringent and sedative ointment¹ or suppository.² As contributing factors to successful treatment may be mentioned improvement of the general circulation by cardiac stimulants, replacement of a prolapsed or retroverted uterus, and the use of a pessary to correct a retrocele. A thrombotic hemorrhoid that is outside the grasp of the sphincter should be incised and the clot turned out. This can usually be done under local anæsthesia, but

¹ R. Ung. gallæ.
 Ung. stramonii (U. S. P.) aa
 M. et ft. ung.
 Sig.: Apply locally as directed.

² R. Ext. stramon. gr. ½
 Ac. tannic. gr. ½
 Plumbi carbonat. gr. 1
 Sol. plumbi acetat. dil. ℥ 2
 Creosot. ℥ ½
 M. et ft. suppository No. 1.
 Sig.: Insert one at night.

in some cases, when the pain is very severe, general anæsthesia may be necessary.

Inflamed hemorrhoids should be treated by the application of soothing lotions, either cold or hot, whichever gives most relief. Hot or cold solutions of dilute alcohol, lead-water and laudanum, or witch-hazel are favorite remedies. An injection of warm olive oil (1 to 4 drams) with laudanum (5 to 10 drops), administered through a small, soft-rubber catheter or a soft-rubber ear syringe, will often be prompt in its results. An opium and belladonna suppository may be effectual.

The operative treatment of hemorrhoids consists in removal of the growths by excision or ligation. The former is the preferable method and



FIG. 436.—Removal of hemorrhoids by clamp and cautery.

may be accomplished in a number of ways. The clamp and cautery method is rapid, the danger of infection is reduced to a minimum, sloughing is inconsiderable, and the pain is not as severe as when the hemorrhoid is ligated or when sutures are employed. The technic is as follows:

After divulsion of the sphincter, the hemorrhoids usually are well exposed. As they project from the anal margin they divide into several groups. Each group in turn is subjected to the following plan of treatment: The tip is caught with a blunt hemostat, and traction is made upon it. The skin in the peripheral aspect is divided by a V-shaped incision, the base being directed toward the anus. When the mucous membrane is reached, the incision is continued into the membrane, completing the base of the V, which runs parallel to the rim of the anus. The skin and mucous mem-

brane above the incision are now pushed away by blunt dissection, and a hemorrhoid clamp placed along the raw area thus exposed, the heel of the clamp pointing toward the lumen of the gut. The clamp is tightly closed, and the projecting hemorrhoidal mass cut away with scissors at a point about one-eighth of an inch from the surface of the clamp. The remaining tissue beyond the clamp is now cauterized until it is thoroughly charred. Upon removing the clamp a charred ribbon of tissue is found extending in a radial direction from the anus outward along the path of excision (Fig. 436).

Bleeding seldom follows the operation if the clamp is properly placed, *i.e.*, with the heel pointing toward the gut, so that the greatest amount of pressure is exerted upon the source of the most active blood supply, and if the charred area of tissue projects a little from the surface of the clamp and has not been burned off flush with its surface. A narrow strip of drainage gauze thickly coated with sterile vaseline is now introduced within the

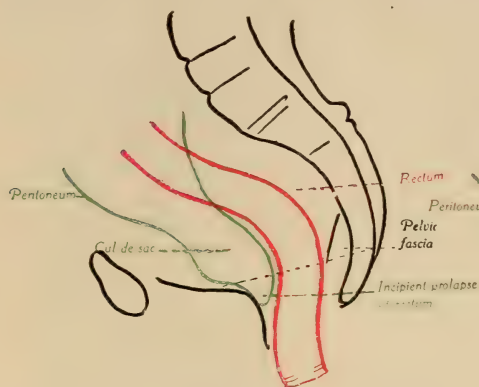


FIG. 437.—Moschcowitz's conception of prolapse of rectum; incipient prolapse. (Courtesy Surgery, Gynecology and Obstetrics.)

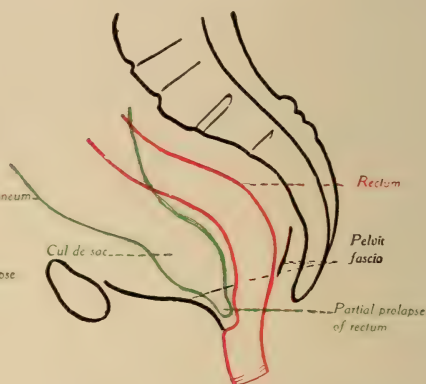


FIG. 438.—Moschcowitz's conception of prolapse of rectum; partial prolapse. (Courtesy Surgery, Gynecology and Obstetrics.)

rectum. This will serve to direct attention immediately to any hemorrhage that may take place within the bowel. This strip is removed at the end of five days, when the bowels are opened with castor-oil.

PROLAPSE OF THE RECTUM

Prolapse of the rectum not infrequently occurs in connection with extensive prolapse of the uterus or with marked relaxation of the vaginal outlet with rectocele. It is then a part of a general relaxation and loss of supporting power of the muscles and fascia of the pelvic floor. Prolapse may affect the mucosa alone (partial prolapse) or the entire wall of the rectum (complete prolapse). The predisposing causes of rectal prolapse are multiple childbirth and consequent injuries to the pelvic floor, relaxation of the sphincter muscles of the anus from paralysis, exhausting diseases, injury to the sacral plexus, etc. Straining at stool, as in some cases of rectocele, urethral obstruction, chronic constipation, and chronic diarrhoea, is a prolific source of prolapse. Tumors of the lower bowel, hemorrhoids, polyps, etc., which drag upon the mucous membrane, are occasional causes.

Abnormal and possibly congenital elongation of the mesosigmoid and mesorectum are said to be among the provocative lesions.

According to Moschcowitz and Jones, many of the so-called prolapses of the rectum are in reality hernias (Figs. 437 to 440). The anterior wall of the rectum is pushed through the anus by the hernial contents, and the sac of the hernia is a prolongation or a deepening of the peritoneal cul-de-sac, known in the female as the pouch of Douglas.³ The usual contents of the hernia is small bowel. Defects in the transversalis fascia, known as the pelvic fascia in this region, with which the peritoneum is so intimately related, are uniformly present and may be either congenital or acquired. This conception of the subject which unquestionably is correct, applies to all cases except those of simple prolapse of the rectal mucosa.

Symptoms.—The symptoms depend on the degree of prolapse that is present. In early cases there may be no subjective symptoms. In well-

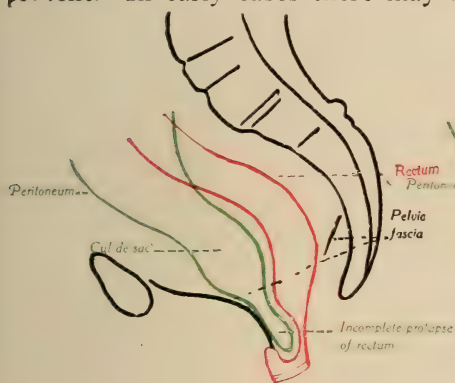


FIG. 439.—Moschcowitz's conception of prolapse of rectum; incomplete prolapse. (Courtesy Surgery, Gynecology and Obstetrics.)

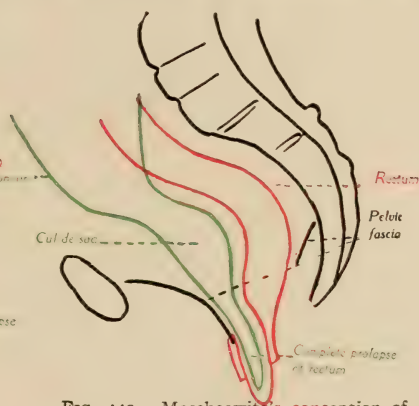


FIG. 440.—Moschcowitz's conception of prolapse of rectum: complete prolapse.

marked cases there are irregular and unsatisfactory bowel movements, a sensation as if the movement was incomplete, pain and discomfort about the anus, partial or total incontinence of flatus and fæces, discharge of mucus and blood, and the protrusion of the inverted rectum, either constantly or upon attempts at defecation.

³ There are three varieties of deep cul-de-sac:

First: The cul-de-sac may be very deep *congenitally*. The rectum and the bladder appear flattened against the pelvic walls and the peritoneal lining of the deep pelvis is smooth and adheres closely to the pelvic walls. In this type the fascia is exceedingly weak, and the weight of the intestine causes rectal and vaginal protrusions. To this group belongs virginal prolapse.

Secondly: The cul-de-sac becomes very deep in multiparæ with lacerated perineums; the peritoneum is redundant, but not densely adherent to the pelvic wall or to the pelvic organs. The fascia, although torn, is still able to support certain of the pelvic structures, and the peritoneum also acts as a suspensory support to the vagina and the rectum. Although this anatomic peculiarity is frequent in multiparæ, prolapse of the uterus and large rectocele are relatively infrequent.

Thirdly: Another and rare type is seen in which there is an opening in the fascia between the vagina and the rectum, extending from the posterior cul-de-sac to the levator muscles, and accompanied with a vaginal protrusion that is somewhat analogous anatomically to an inguinal hernia.

Diagnosis.—The diagnosis of rectal prolapse is readily made by inspection of the anus while the patient is in the dorsosacral or in the squatting position and attempting to defecate. Further examination is required to determine whether the mucosa alone or the entire rectal wall is involved.

Treatment.—Prolapse of the rectal mucosa may be treated by linear cauterization or by excision of the prolapsed part. In conjunction therewith, the rectal wall may be supported by a slight modification of the ordinary operation done for rectocele, a condition with which prolapse of the rectal mucosa is frequently associated. When this plan is adopted, the anterior wall of the rectum should be freely exposed after division of the posterior vaginal wall. The rectum should be freed from its surrounding attachments, above the level of the levator ani, and sutures introduced in two directions so as to shorten the rectum, as well as to narrow its lumen.⁴ Whatever method of posterior colporrhaphy is contemplated may now be carried out and completed in the usual manner. In mild cases, all that may be necessary is to make a long incision through the posterior vaginal wall, extending well up toward the cervix, separate the rectum from the surrounding tissues, and fix it at as high a level as possible, by means of sutures that embrace the upper angle of the posterior vaginal incision, the pelvic fascia, and rectal wall. These are continued downwards at intervals, the lowermost approximating the fibers of the levator ani.

The basis of the operative treatment suggested by Moschcowitz and Jones consists in obliteration of the posterior cul-de-sac. This throws the weight of the intestine against the uterus, broad ligaments, bladder, and symphysis, just the opposite to the condition that obtains with an open deep cul-de-sac. In the latter case the weight of the intestines is thrown on the anterior rectal and the posterior vaginal wall.

Moschcowitz, in closing the cul-de-sac, inserts purse-string sutures from below upward, tying each one as it is completed (Fig. 441). He passes the sutures through the serous coat of the bowel, and when he reaches the supravaginal cervix and the uterus, he includes them. He directs that one must carefully avoid the internal iliac vessels, which can be recognized by palpation, and the ureters, which may be located by catheterization, if this is required. In aged women fixation of the uterus may be done in connection with the other operation. It is not necessary to suspend the sigmoid. Usually the bowels move of their own accord in less than a week. As a rule, catheterization is necessary.

TUMORS OF THE RECTUM

New growths of the rectum may spring from muscle, connective tissue, or mucosa. Among those most frequently encountered, therefore, are adenoma, papilloma, myoma, fibroma, myxoma, sarcoma, and carcinoma, although teratomata are also found at times.

⁴ Such sutures may be passed also after the method of Lane, *i.e.*, through an incision from the lower end of the sacrum to the anus. The coccyx is removed, exposing the posterior rectal wall, catgut sutures are passed through the muscular coat in the long axis of the gut for a distance that corresponds to the requisite amount of shortening. After the longitudinal sutures are tied, interrupted transverse sutures are passed that approximate the lateral walls of the rectum and narrow the lumen of the gut.

POLYPS

Benign rectal growths are frequently pedunculated, when they are known as polyps. The most common form seen in children is formed by hypertrophy of a solitary follicle. The surface is covered by epithelium and the connective tissue is myxomatous. Other forms of rectal polyp are adenoma, papilloma, fibroma, and lipoma. Polypoid adenomata and papillomata are most often seen in adults. Adenoma is most often multiple, and is said to recur. When multiple the individual tumors vary in size, form, and appearance. Instead of being polypoid, they may have a broad base of attachment. The sigmoid and the colon may be involved coincidentally. The tumors are prone ultimately to undergo malignant degeneration.

Symptoms.—The occasional presence of mucus and blood in the stools may be the only indication of a polyp if the growth occupies a position well above the sphincter. Active symptoms appear only when the polyp comes down within the grasp of the sphincter, when there is a sensation of fullness, a frequent desire to defecate, spasm of the sphincter, and mucous and bloody discharge from the rectum.

Diagnosis.—The diagnosis can be made by inspection or by digital examination. The differentiation of benign hypertrophied follicles, adenomata, and papillomata from malignant growths of similar form is made partly from the fact that there is no induration at the point of their insertion into the mucous membrane.

Treatment.—The treatment consists in snaring the pedicle, if the tumor is high, or in crushing the pedicle with a clamp and division by a cautery knife, if the tumor is low. If the tumor is attached broadly to the bowel, after excising the base down to the muscular coat, the edges of the mucosa should be brought together with sutures. If the pedicle is at such a height that invagination of the peritoneum therein is possible, the pedicle should be securely tied.

Medicinal treatment of multiple adenomata is of little value, and even surgical treatment is likely to prove unsatisfactory. If malignant degeneration takes place, complete extirpation of the affected parts holds out the only hope for cure. In some cases the involvement may be so extensive as to make removal impossible.

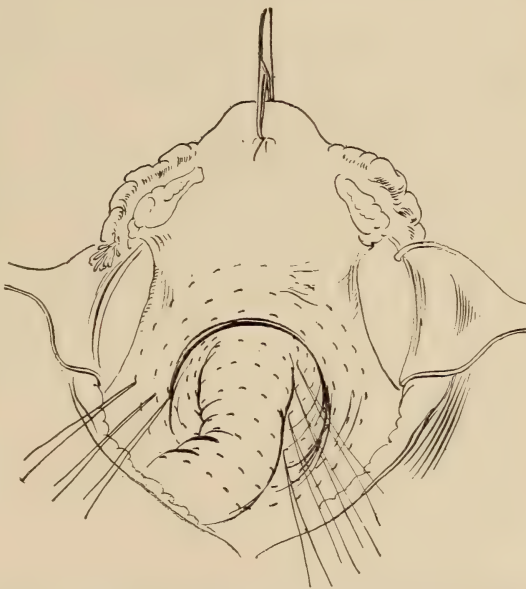


FIG. 441.—Scheme for inserting sutures in Moschcowitz's operation for cure of prolapse of rectum by obliterating cul-de-sac of Douglas.

CARCINOMA OF THE RECTUM

Carcinoma may involve the anal, the extraperitoneal, and the intraperitoneal portions of the rectum, as well as the sigmoid. More than half of all rectal carcinomata involve the intraperitoneal portion, and 10 per cent. are confined to the anal part. About the anus the most frequent variety seen is epithelioma; above that point adenocarcinoma is the rule.

Etiology.—Cancer of the rectum is less common in women (40 per cent.) than in men (60 per cent.). Other diseases of the rectum, such as multiple polyps, adenomata, and mucous colitis, frequently precede cancer.

Symptoms.—There are no characteristic symptoms in the earliest stage. Vague pain in the sacral region, with increasing constipation or a tendency to diarrhoea and slight digestive disturbance, may be the first indications. Later on loss of weight, pain in the rectum, and the discharge of mucus and blood from the anus appear.

When carcinoma develops secondarily, the symptoms of the primary condition, of course, precede it.

Diagnosis.—Every patient with symptoms suggestive of malignant disease demands a digital examination of the lower bowel and a proctoscopic and a sigmoidoscopic examination of the upper rectum and sigmoid flexure.

In the earliest stages, carcinomata appear as plaque-like, slightly movable deposits beneath the mucosa. The underlying mucosa is congested, thickened, and smoother than normal. In some varieties small papillary excrescences, connected with the mucous and submucous tissues by an indurated base, are seen. Early scirrhus cancer may appear in the form of an annular deposit in the submucosa, closely resembling a fibrous stricture.

A microscopic examination should always be made in order to distinguish between benign and malignant conditions if it is easy to obtain tissue for this purpose through the proctoscope; otherwise the clinical findings may be accepted as conclusive and treatment advised accordingly. Exploratory celiotomy may be indicated in growths situated high up.

Treatment.—The only hope of cure lies in early extirpation of the diseased portion of the bowel with a surrounding border of healthy tissue. The one exception to this statement is found in cases of epithelioma of the anus—here radium may be effectual (see Radium and Röntgen Ray Therapy, Chapter XL). Very early epithelioma may be treated also by local excision or destruction with the cautery. Epithelioma and adenocarcinoma of the lower bowel require total extirpation of the diseased bowel, including the anus; the inguinal lymphatics also should be removed. The technic of Cripps or Kraske may be selected.

Operation for cancer of the second and third portions of the rectum and the recto-sigmoid should be performed in two stages. In the first, the abdomen is opened, a thorough exploration is made of the lymph-glands, liver, etc., and in favorable cases the diseased area of the bowel is excised. If the line of division below leaves a half inch or more of peritoneum-covered bowel and the length of bowel resected is not too great, an end-to-end tube anastomosis may be performed between the proximal and the distal ends.

If the rectum is so extensively involved that complete extirpation is re-

quired, the sigmoid should be divided above the growth and the proximal end implanted into the abdominal wall so as to form a new anus. The diseased area is then separated by ligation of its mesenteric attachments and the distal end turned in and pushed down into the pelvis with the growth. The pelvis is then excluded from the peritoneal cavity by peritoneal suture, utilizing the back of the bladder, the uterus, the broad ligaments, and any peritoneal folds that are available. After six days a perineal incision is made and a Kraske resection of the lower sacrum with removal of the recto-sigmoid and rectum, including the anus, is performed.

For the technic of these operations the reader should consult the writings of Cripps and Charles Mayo.

STRICTURE OF THE RECTUM

Stricture of the rectum may be annular, valvular, tubular, or linear. Strictures may be due to congenital malformations or acquired lesions. They may be spasmodic or organic in nature. Acquired organic strictures are due to neoplasms growing into and contracting the rectal walls, to destructive lesions of the submucosa (tuberculous, syphilitic, dysenteric ulcerations, traumatism, perirectal abscess, etc.), and to inflammatory lesions of the surrounding tissues that extend into and compress or constrict the gut.

Symptoms.—The symptoms consist in gradually increasing and persistent constipation, alternating or combined at times with diarrhœa. The latter results from the irritation of hard fecal masses retained above the point of obstruction. Later fecal concretions may be felt in the sigmoid and colon. Anorexia, foul breath, coated tongue, skin eruptions, and other evidences of intestinal intoxication are present. In the severe forms mucus and blood are found in the stools.

Diagnosis.—When the stricture is within a finger's length of the anus, the diagnosis is made without difficulty. In strictures higher up, the pneumatic proctoscope and sigmoidoscope are the most valuable aids to diagnosis, but exploratory celiotomy may be required in some cases.

Treatment.—A nutritious mixed diet should be ordered. Milk produces hard fæces and is unsuitable in these cases. Powerful purgatives should be avoided, but laxatives may be taken regularly. Of the latter, the best is olive oil or one of the refined paraffine oils, taken several times daily.

Although not often curative, gradual dilatation is the most used and most satisfactory method of treatment.

BIBLIOGRAPHY

- BRETTAUER, J.: "The Rectum and Bowel in Their Relation to Pelvic Disease." Amer. Jour. Obst., lxi, 777.
 CRIPPS, W. H.: *Diseases of the Rectum and Anus*. London, Churchill, 1907.
 JONES: "Relation of the Deep Cul-De-Sac to Prolapse of the Rectum and Uterus and to Rectocele." Post. Med. and Surg. Jour., 1916, clxxv, 623.
 LYNCH, J. M.: *Diseases of the Rectum and Colon and Their Surgical Treatment*. Philadelphia, Lea, 1914.
 MAYO, C. H.: "The Choice of Operative Procedure in Cancer of the Rectum and Pelvic Colon." Annals Surg., 1917, lxxv, 129.
 MOSCHCOWITZ, A. V.: "The Pathogenesis, Anatomy and Cure of Prolapse of the Rectum." Surg., Gynec. and Obst., 1912, xv, 7.
 MURPHY, J. B.: *Intestinal Surgery*, Chapter xxiv, in Kelly and Noble, *Gynecology and Abdominal Surgery*, vol. ii. Philadelphia, Saunders, 1907; *Ibid.*: "Resection of the Rectum per Vaginam." Phila. Med. Jour., 1901, vii.
 TUTTLE, J. F.: "The Relationship Between Rectal Diseases and Those of the Female Pelvic Organs." Amer. Jour. Obst., 1911, lxi, 784.

CHAPTER XXVIII

BACKACHE

BACKACHE may be indicative of abdominal or pelvic disease, as well as of disorders of the bones, muscles, and joints of the lower abdomen, back, and thighs. The reason for it may be at once apparent—a quickly ascertained cause and effect—and the treatment obvious, or, in spite of careful search, no definite cause may be found. Not infrequently backache has been ascribed to abdominal or pelvic disorders, and yet, when the latter were corrected, the pain persisted and the patient did not improve. Attention has then been directed to those disorders of the constituent structures of the parts which are well known, such as spinal curvature, hip-joint disease, disproportionate length of the lower extremities, tuberculosis of the vertebræ or the sacroiliac joints, hypertrophic arthritis (spondylitis deformans), Charcot's spine, and spinal injuries. If, upon careful examination, none of these was found, the symptoms were spoken of as rheumatic or gouty, and finally, when appropriate treatment did not bring relief, the condition was given up as hysteric or neurasthenic. All of which is mentioned here to preface the statement that certain factors that are operative in the production of backache may easily be overlooked. It is to these that attention has been drawn by the work of Reynolds, Lovett, Dickinson, Goldthwaite, Truslow and others.

The first is the constant demand that is made upon certain muscle groups and joints in the maintenance of equilibrium.

The assumption of the erect posture without conscious effort depends upon the maintenance of equilibrium.¹ In the normal erect posture (Fig. 442), maintained without conscious effort, a vertical line drawn through the center of gravity of the body must drop within a trapezoid formed by the outer borders of the feet and imaginary lines connecting the tips of the toes and the back of the heels. The supporting structures are the arches of the feet, secured by their pillars, the heel bones, and the heads of the metatarsal bones. The line of the *center of gravity*, when the body is in a state of perfect equilibrium, coincides with a plane that would cut the occipito-atlantoid joint, a portion of the cervical, thoracic, and lumbar vertebræ, the pelvis between the anterior spine and the anterior rim of the acetabulum, the knee-joint near the patella, and the foot near the tarsometatarsal junction, these relationships being altered in

¹ Both lateral and anteroposterior equilibrium must be maintained. Lateral equilibrium is easily maintained by placing the feet nearer together or further apart; disturbance in lateral equilibrium is associated with well-marked orthopedic deformities (spinal curvature, tilted pelvis, shortened leg). These are readily recognized, their significance is well understood, and the treatment has been well established, so that they need not be discussed here further than to say that disturbance of lateral may complicate or precede disturbance in anteroposterior equilibrium. They must always be looked for and corrected when found. We are concerned here chiefly with the less easily recognized, less easily cured, and less generally appreciated defects in anteroposterior equilibrium.

accordance with the anatomic peculiarities of the individual. If the equilibrium is to be maintained, projection of a part of the body in front of this line must be compensated for by projection of another part back of the line. In the normal erect posture, the parts in front of the line of the center of gravity are equal to those back of it, except where muscular stress exerted on adjacent parts compensates the overbalance. Some of the joints permit forward, and some backward, bending, some both, the limitation in one direction or the other being due to the arrangement of the ligamentous or bony features.²

When the body is erect and perfect equilibrium is maintained, the line of the center of gravity runs through or near to all the points of anteroposterior movement, and the effort of the *muscles and ligaments anterior to the line* is equal to the effort of those *posterior to the line*; none are too greatly taxed; none too seldom called upon. When the center of gravity is displaced forward, the posterior muscle and ligament groups must perform extra work; when it is displaced backward (rare), the anterior muscle and ligament groups are under increased stress.

The joints that are especially concerned in the maintenance of equilibrium are the vertebral, the lumbosacral, the sacroiliac, and the tarsometatarsal. These are the joints of limited motion, and are subjected to greater strain than are the hip-, knee-, and ankle-joints.

The vertebral and lumbosacral joints are supplied with very strong ligaments and are well splinted by muscles. The sacroiliac and the tarsometatarsal joints are those subjected to the greatest strain and are those that have the least natural protection. The sacroiliac joint connects the trunk and the pelvis; in the erect, in the sitting, and even, but to a much less degree, in the supine position, this joint is subject to stress. It is dependent for endurance upon the relation of the articulating surfaces of the sacrum to those of the innominate bones, and the strength of its cartilaginous and ligamentous attachments. It is not splinted or reinforced, except to a very limited extent, by muscles or tendons passing over it. The weight of the trunk transmitted through the spine may carry the promontory slightly downward and forward into the pelvis, the sacrum rotating on a transverse axis passing through the second piece.

The arches of the feet, which bear the weight of the entire body in the erect position, depend for their strength essentially upon the ligamentous attachments between the calcaneum, cuboid, external cuneiform, and third metatarsal bone. In addition they are reinforced by the tendons of the

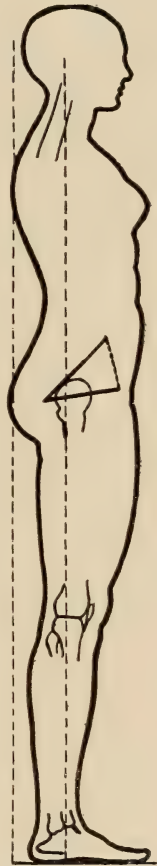


FIG. 442.—Normal posture. (After Dickinson and Truslow.)

² Thus the chin falls forward, but backward bending of the head is limited by the occiput; the trunk bends forward to more than right angles on the thighs, but only slightly backward by virtue of the iliofemoral ligaments; the knees can be flexed, but not bent forward; the ankles can be more extended than flexed.

peroneus longus and the tibialis posticus muscles. To these may be added the plantar fascia and the muscles to the toes arising from the calcaneum.

In disturbances of equilibrium, either forward (usual) or backward (rare) displacement of the center of gravity, the vertebral, lumbosacral, sacroiliac, and tarsometatarsal joints are placed under unusual stress.

Excessive demands of this sort upon the muscles and joints give rise to irritability and fatigue of the muscles, and to congestion and relaxation of the joints, thus giving rise to a symptom-complex known as static backache.

The second of the factors in the production of backache is the predisposition in women to faulty development of the muscles, to joint sprains, and to incorrect postures. That a large proportion of women are deficient in muscular development in general needs no proof; this is due to their relative inactivity after the age of puberty. This faulty muscular development is especially evident in the muscles of the back and abdomen, particularly in women who have worn corsets.

The joints that women are prone most often to overtax and strain are the sacroiliac and the tarsometatarsal. The former may be injured during labor, while the arches of the feet may be weakened by the wearing of shoes that interfere with normal development. Excessive weight, out of all proportion to the muscular and bony development, is also a cause of fallen arches.

Faulty postures in women may be due to the wearing of unsuitable corsets or shoes, weak muscles, developmental defects of the chest and abdomen, pelvic and abdominal ptoses, pelvic inflammation, and obesity.

A third factor to be considered in a study of backache of obscure origin is the effect of remote foci of infection upon the spine and the sacroiliac articulation. In individuals already exhibiting a strain or sprain of the joint a toxic arthritis usually attacks these parts.

These remarks may serve to correlate the following conditions, which, for convenience, will be considered separately.

STATIC BACKACHE

Etiology.—Backache is known as static when it is caused by the fatigue or strain of certain groups of muscles and ligaments the result of excessive demand made upon them in order to maintain equilibrium. The disturbance of equilibrium usually consists in a displacement of the center of gravity forward, which throws an increased burden on the lower posterior group of muscles. Occasionally the center of gravity is displaced backward, and when this occurs the back muscles are strained above and the iliopsoas anteriorly and below. Disturbance of lateral balance may occur in combination with disturbance of anteroposterior balance.

Disturbances in equilibrium are due to the following causes:

1. *Flat-foot.*—The feet are pronated and the tarsus sinks to the ground. This results in changes and readjustments of the entire weight-bearing column, and may cause so marked a disturbance of balance as to produce severe backache, as well as pain in the feet, legs, and thighs.
2. *Pelvic disorders of an inflammatory nature* that compel the woman to assume a forward position in order to ease sensitive pelvic parts.

3. *Pelvic tumors*, or excessive accumulations of fat in the abdomen or anterior abdominal wall, which, by their weight, lead the patient to assume a forward position.

4. *Relaxed and pendulous abdomen*, often associated with displacements of the abdominal and pelvic organs or prolapse.

5. *Skeletal defects*, such as knock-knees, difference in the length of the extremities, and defective articulation between the vertebræ, usually between the fifth lumbar vertebra and the sacrum.

6. *Faulty posture*, of which there are two varieties—first and most frequent, the “kangaroo” type (Fig. 443), in which the center of gravity is displaced forward; secondly, the “gorilla” type (Fig. 444), in which the center of gravity is displaced backward. The kangaroo type of posture may be associated with—(a) the slumped, visceroptotic figure (Fig. 445), with shoulders drooping forward, narrow intercostal angle, long waist, and relaxed abdominal parietes; (b) the “overfeminine figure” of Reynolds (Fig. 446), trunk atrophy (corset pressure), small bones, narrow intercostal angle, slender, tapering waist, with broad and excessively padded hips, a deformity due to tight lacing and insufficient exercise.

Symptoms.—The principal symptom is backache, which affects especially the lower lumbar and sacral region when the patient is erect. In severe cases it is more or less constant, but it may be intermittent in milder ones. The discomfort may be described as a feeling of extreme fatigue or an aching, dragging pain. Relief is not obtained by the recumbent posture alone, but the patient may have found that a certain position that relaxes the strained and fatigued parts gradually brings relief.

The pain may be referred to the occipital and upper dorsal region. If there is an associated sacroiliac sprain, pain may be present in the coccygeal area and along the distribution of the great sciatic nerve. If the feet are pronated or flat, there is pain in the legs and feet. As a rule, the pain is bilateral, although one side may be more painful than the other. Tenderness is often present over the sacroiliac joint, since in severe cases of static backache the faulty posture has put excessive strain on this articulation. Muscle spasm, either on one or on both sides, is always present in static backache. When static backache is unilateral, the sacroiliac joint of the

FIG. 443.

FIG. 444.

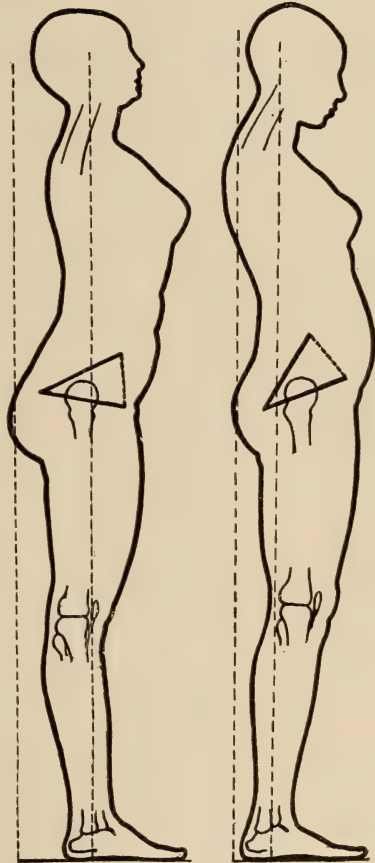


FIG. 443.—Kangaroo posture. (After Dickinson and Truslow.)

FIG. 444.—Gorilla posture. (After Dickinson and Truslow.)

affected side is especially likely to be tender and painful. There may be some limitation of motion, both laterally and anteroposteriorly, but this finding is not constant.

Diagnosis.—In making a diagnosis of static backache the most painstaking effort often is required. The patient must be examined systematically, with special regard to the following: .

- (a) The attitude in general, whether bent forward (kangaroo), backward (gorilla), or normal.
- (b) Shoulders back and square or forward and round.
- (c) Abdomen rounded and pendulous, or well held up and flat.
- (d) Feet well arched or flat; shoes with high or low heels, roomy or tight.
- (e) Constriction of waist.
- (f) Width of buttocks.

Preliminary observations may be made with the outer clothing removed, the patient standing clothed in corsets and shoes. A graphic method

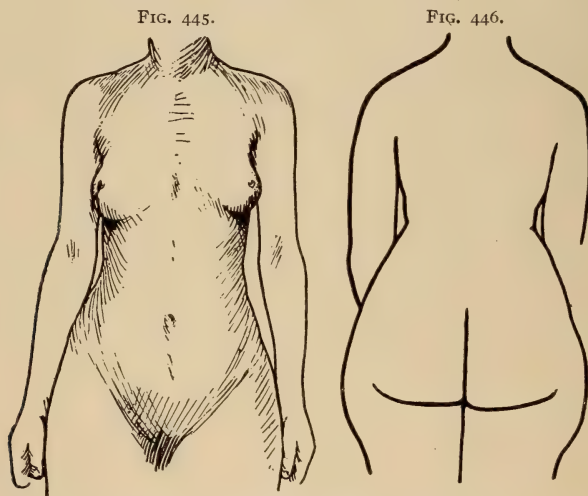


FIG. 445.—Slumped visceroptotic figure. (After Smith.)
FIG. 446.—Overfeminine figure. (After Reynolds.)

of recording the posture (Dickinson) and the anteroposterior equilibrium is made by tracing the outlines of the patient upon a large sheet of paper hung upon the wall. The patient is directed to stand with the side to the wall, the backs of the heels touching a strip of wood fixed to the floor at right angles to the wall. A tracing is then made as shown in the illustration (Fig. 447). At this point in the examination the corset and shoes should be carefully inspected (see page 543). The corset and shoes should then be removed and another tracing made. A comparison of the tracings shows the normal attitude of the patient and the extent to which it has been modified by her dress, especially by her corsets and shoes.

*Normal Type.*³—The head is level. The line of the dorsal spine is gently

³ The following notes descriptive of the normal posture and of the two most frequent deviations have been modified from Truslow.

rounded and touches the "rear perpendicular."⁴ The line of the lower dorsal and lumbar spines curves gently forward and then backward, the top directly above the bottom. The angle of the plane of the pelvic inlet is about 60 degrees with the horizon. The thighs and the legs, the hip-joint, and the knee-joints are in or adjacent to the plane of the center of gravity, with a proper balance maintained between the flexor and the extensor muscles, and therefore no strain. The body weight is well distributed between the heels and the balls of the feet, and there is good control in walking.

Kangaroo Type.—The head is prone to tilt upward. The shoulders are in front of the rear perpendicular. The lower dorsal and lumbar curves are less marked, and the line of the lower dorsal and lumbar spines slants downward and backward. The sacrum tends to rotate forward between the ilia, straining the sacroiliac joints, the erector spinæ group of muscles are stretched and strained. The pelvis is rotated forward on the hip-joints, and the plane of the inlet is at an angle of more than 60 degrees. The line of the center of gravity is in front of the hip-joints, the ham-strings are stretched, the flexors are relaxed, the knees are displaced backward (extreme extension), the center of gravity is in front of the joint, the extensor muscles of the leg are over-stretched, the flexors are relaxed, and the weight of the body is unequally distributed upon the feet, most of the strain falling on the balls and arches.

Gorilla Type.—This type is much less frequent than the others mentioned. The head is prone to tilt downward, the shoulders are back of the rear perpendicular, and the line of the lower dorsal and lumbar spine is forward. The sacrum tends to rotate backward between the ilia, putting a strain on the joints. The iliopsoas muscles are stretched; the abdominal muscles are on tension. The pelvic inlet is at an angle of less than 60 degrees to the plane of the horizon. The center of gravity is back of the hip-joint; there is strain on the iliopsoas ligament and flexor groups of muscles. The knees are forward; the extensors of the feet are on tension; the weight of the body is borne especially by the heels, but in an effort to equalize the strain there is tension of the tendons of the extensor group of the legs.

After determining the anteroposterior balance of the individual (center of gravity normal or displaced forward or backward), the examiner may

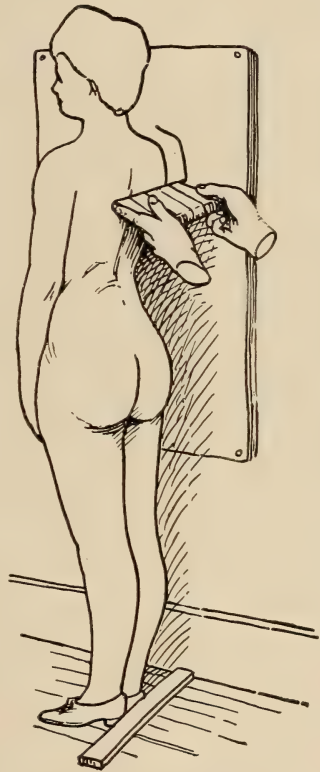


FIG. 447.—Patient's outline being traced. (After Dickinson and Truslow.)

⁴ A perpendicular line passing through the upper extremity of the gluteal crease.

devote his attention to a search for contributory causes of disturbances of the equilibrium.

Chest Defects.—In women, with the notable exception of singers, athletes, and those who have not worn corsets, the epigastric angle is more acute than normal, and the lower part of the thorax is compressed from side to side.

Muscular Development.—Almost all women, except those who have followed athletic pursuits and those who have avoided the use of corsets, show deficient development and lack of tone of the muscles. In women who have borne children this is most noticeable in the abdominal wall and back.

Feet.—When the arches of the feet are flat, the tarsus sinks to the ground and the feet are pronated. This results in changes and readjustments in the entire weight-bearing column above, and may result in so marked a disturbance in balance as to produce pain in the feet, legs, and thighs, as well as backache.

Constriction About the Waist.—Many women who wear corsets show narrowing of the lower thorax and constriction about the waist. Marked cases are invariably accompanied by visceroptosis, and pendulous abdomen and excessive fat pads are commonly associated.

Fat Pads.—Normally, the layer of fat on the abdominal wall above the umbilicus should be thicker than the layer below it. In many women, as a consequence of corsets, the fat is thicker below the navel; pads of fat are also present over the iliac crests, over the trochanters, and beneath the buttocks. These pads may vary in size from the rotundity of form considered characteristic of the sex, to gross and fleshy protuberances and actual deformities.

Differential Diagnosis.—Before a positive diagnosis of static backache can be made, the influence of existing pelvic and vertebral disorders must be ruled out. Pendulous abdomen, visceroptosis, and displacement of the pelvic viscera may precede or accompany postural defects. Pelvic disease of an inflammatory nature may precede postural defects, the patient unconsciously leaning forward and relaxing the abdominal wall in order to lessen intra-abdominal tension and relieve pressure on the sensitive viscera. Backache due to downward displacement of abdominal or pelvic viscera is usually promptly relieved by the recumbent posture, and even in the erect position the patient can be made comfortable by the replacement and support of the affected structures.

Backache due to pelvic disorders is usually most severe just before or during the menstrual period, and is often accompanied by bladder and rectal symptoms. When postural defects are accompanied by inflammatory or neoplastic disorders of the pelvis, it may be necessary to cure the pelvic disease before one can determine how much of the pain is pelvic and how much is static in origin. Structural and organic disease of the spine should not be difficult to recognize. In Pott's disease and following injuries, the back pain is definitely localized. Referred pain, due to pressure on the posterior roots, is frequent, and traceable to the involved area.

Malignant disease of the vertebræ, which occurs at times as the result of metastasis following the removal of pelvic or abdominal neoplasms, is characterized by intense local and referred pain, which is exceedingly difficult

to control. Spondylitis deformans (hypertrophic arthritis) occurs most frequently in men after the age of thirty-five; the general and spinal rigidity, rounded kyphosis, and characteristic referred pain due to root pressure should make the diagnosis clear. Finally, the Röntgen ray will demonstrate the presence of definite lesions.

Static backache may so closely simulate a sacroiliac sprain as to be almost indistinguishable; in fact, with static backache there is always strain or tension on the sacroiliac joints. At times this is the most noticeable result of faulty posture. In sacroiliac sprain due to falls or blows or the result of traumatism incident to labor, the history of the case will reveal the origin of the trouble.

Treatment.—It is obvious that in many cases gynecologic and orthopedic treatment must be combined. Displaced pelvic viscera must be restored to good position and these must be maintained by operation or by mechanical support (*e.g.*, a pessary). Displaced abdominal viscera must be returned to their normal position, and a relaxed abdominal wall must be supported. The measures adopted for the latter purpose (*e.g.*, a properly constructed corset) form a part of the treatment of static backache, as will be seen later.

Orthopedic Treatment.—Since static backache is due to a disturbance of balance in the direction of forward or backward shifting of the center of gravity, and consequent strain and fatigue of joints and muscle groups, to be successful any method of treatment must restore the equilibrium and relieve joint and muscle strain. In restoring balance one must remember that he is dealing with the entire weight-bearing column, and not with one particular part of it.

Two important factors that require consideration at the beginning of the treatment are the shoes and the corsets—shoes, to give the individual an efficient base of support, and corsets, to secure the proper relation between the trunk and the lower extremities.

Shoes may be so constructed as to correct flattening of the arch and pronation of the foot. Flattening of the arches should be treated by having foot-plates built into the shoe or by wearing leather and felt inlays under the arch. Pronation that is not corrected by wearing the proper arch support may be dealt with by raising the inner edge of the shoe from three-sixteenths to one-quarter of an inch. The heel of a shoe has an important bearing upon the distribution of the weight superimposed upon the foot. The higher the heel, the greater the weight that must be borne by the ball and arch of the foot. For this reason, and because their use leads to deformity of the toes and heads of the metatarsal bones, *excessively* high heels must be regarded as injurious. The height of the heel also has an important bearing upon the equilibrium of the body above, and the relationship between the lower extremities and the trunk in the position of the line of the center of gravity. By raising the heels of the feet (in cases of forward displacement of the center of gravity), high-heeled shoes tend to effect a spontaneous and unconscious correction of attitude and a displacement backward of the center of gravity. For this reason they may be prescribed successfully in cases of static backache of the "kangaroo" variety of de-

formity. In backache due to deformities of the "gorilla" type, the heels may be lowered in order to favor a forward displacement of the center of gravity. Whatever form of shoe is selected, the physician should impress upon his patient the desirability of wearing shoes of the same size, form, and heel throughout the entire day.

Corsets are used in the treatment of static backache for the purpose of

FIG. 448.



FIG. 449.



FIG. 448.—Corset for kangaroo posture. (After Dickinson and Truslow.)
FIG. 449.—Corset for gorilla posture. (After Dickinson and Truslow.)

correcting postural abnormalities of the "kangaroo" or "gorilla" type (Figs. 448 and 449). These corsets should be so fashioned as to throw the trunk backward (usual) or forward (rare) upon the pelvis. In order to do this the corset must grip the pelvis firmly, thus fixing it and adding strength to the sacroiliac articulation. It must also support the lower abdomen, and in this way correct the visceroptosis that is present. The proper corset, therefore, fits the patient snugly about the pelvis, so that it is capable of binding the bones together and of forming a fixed base, from

which its shape will influence the relation of the trunk to the pelvis. The front is straight and begins over, or immediately above, the pubic crest; it is not high in front; its back is so curved in at the waist-line as to correspond to the normal dorsolumbosacral curve, and it is slightly incurved at the sides. The good corset firmly encircles the pelvis, supports the lower abdomen, elevates the chest and shoulders, throws the center of gravity backward, and reinforces the muscles of the back. The corset required for the unusual "gorilla" type must be longer behind, so as to throw the shoulders slightly forward, and its incurve behind must be flattened in the dorsal region. A properly devised corset (Figs. 450 and 451) does not constrict the waist, and the pressure it exerts is greatest at its lowest point and becomes progressively less as its upper borders are approached.

FIG. 450.

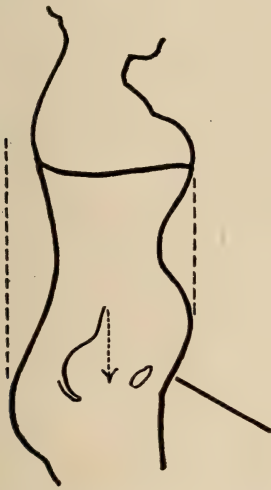


FIG. 451.

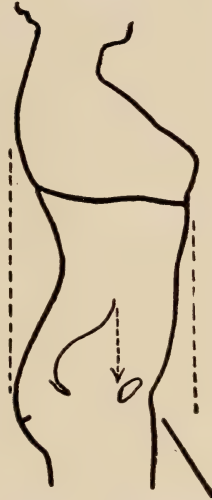


FIG. 450.—Bad type of corset. (After Dickinson and Truslow.)
Hour-glass shape, maximum pressure at waist line, chin and shoulders
thrown forward, inlet leveled.

FIG. 451.—Good type of corset. (After Dickinson and Truslow.)

When the backache is very severe and marked lordosis is present, the corset may be supplemented advantageously by a support of the Jones type. This consists of a triangular leather back-piece, reinforced with two light steel uprights and an abdominal pad attached to the back-piece by straps. The back-piece should extend from the end of the sacrum to a point just below the shoulder-blades. It is worn under the corset, and when properly applied and adjusted, aids materially in splinting the back and lifting the abdomen. Merrill has designed an excellent splint (see Fig. 453).

A properly fitted corset or corset and brace may be almost unendurable at first; it often so radically changes the carriage and figure of the woman as to cause mental as well as physical distress. The clothing needs alteration, since the waist-line is larger, etc.; but if she is encouraged to persist in wearing the new corset, and proper carriage and dress are insisted upon, after a little time the corset that at first appeared unendurable becomes almost in-

dispensable to her comfort, and the improvement in figure becomes a source of gratification. For women engaged in hard work the snugly fitting corset is especially trying at first.

After fitting the patient with the proper shoes and corsets, she should be directed to rest for the greater part of each day until muscle irritability, spasm, and tenderness have subsided. Suitable exercises should now be prescribed, which will improve the poise and strengthen the muscles generally, but especially those of the back and abdomen. In poorly developed and weak subjects massage may be a valuable preliminary. The aim of the treatment should be to so strengthen the muscles and correct the carriage that proper equilibrium may be maintained without artificial support. Nevertheless, in spite of the most painstaking efforts, the patient may always require the assistance of specially constructed corsets and shoes. In emaciated subjects it is highly important to increase the weight, and every effort toward effecting that end should be employed. Probably the most difficult cases occur in the very fat, and here strict regulation of the diet is imperative.⁵

SACROILIAC SPRAIN

Etiology.—The sacroiliac articulation is exposed to considerable strain. Being the joint connecting the spine and the pelvis, it must bear the weight of the superimposed spinal column, thorax, upper extremities, and head when

⁵ The treatment outlined by Dickinson and Truslow is as follows:

THE MECHANICAL TREATMENT OF THE "KANGAROO" TYPE

A. Supportive.

1. The corset (Fig. 448) must have: (a) Low abdominal support; (b) front lines straight, slanting slightly forward as carried upward and with inside pressure decreasing as ascending; (c) about the pelvis, tight circumferential lines, requiring reinforcement with inelastic webbing; if there is sacroiliac strain (d) the back ascending lines should be made more nearly perpendicular than is the patient's back. Sometimes light steel reinforcement is necessary.
2. Support of the feet: (a) The patient may at first wear higher heels than in the other type of posture, but the corset correction of the poise of the trunk tends automatically to adjustment of the knee and foot balances; (b) special foot-braces may be used, if otherwise indicated, but the plantar arch unbalances are not usually due to the malpositions of faulty anteroposterior posture.

B. Gymnastic.

1. Educative: train posture.
2. Muscle building: especially abdominal, buttocks, and calf muscles.

THE MECHANICAL TREATMENT OF THE "GORILLA" TYPE

A. Supportive.

1. The corset (Fig. 449) must have: (a) Back lines curved in and forward for the hollow of the back. A special sacral pad, thicker and broader above than below, may be inserted at the proper place inside the corset to help in shifting the lower spine forward. (b) About the pelvis, tight circumferential reinforcement, especially if there is sacroiliac strain; (c) low abdominal support; (d) the front ascending lines should be straighter than the present pendulous abdomen deformity, and carried as much forward as ascending.
2. Support of the feet: (a) Height of the heels should be reduced as rapidly as possible. Here the corset correction tends automatically to correct the faulty knee and foot balance, but the general correction of the position must not be retarded by high heels; (b) special foot-braces or specially constructed shoes are often indicated to raise the depressed and painful metatarsal arches.

B. Gymnastic.

1. Educative: train posture.
2. Muscle building: especially scapulovertebral, abdominal, anterior thigh (knee extensors), calf, and toe flexor muscles.

the individual is standing or sitting. The sacroiliac joints are also exposed to strains upon the bony ring and arches of the pelvis, from within or from without, *e.g.*, the passage of the foetal head during labor falls upon the buttocks, jars while riding astride, etc. Every movement of flexion or extension of the trunk throws some strain on this joint, which depends for its integrity upon the interlocking of the opposed bony surfaces and the strength of the ligaments binding them together. The strongest ligaments of the joint are those that run between the posterior surfaces of the iliac bones and the posterior surface of the sacrum. The anterior ligaments are much thinner and weaker, but they are reinforced by the iliopsoas and piriformis muscles. The sacroiliac joint is protected from lateral strain by the bony girdle which is formed by the junction of the innominate bones in the symphysis pubis. The firmness of the articulation at the symphysis is sometimes impaired during pregnancy, and the continuity of the anterior bony ring may be broken by faulty union following symphysiotomy and pubiotomy. Whenever this anterior bony ring is broken, the anterior surface of the sacroiliac articulations is exposed to lateral strain. Difficult labors result in sacroiliac strains, produced either by the pressure exerted by the foetal head as it is molded or dragged through the pelvis with forceps, or by positions such as the Walcher, which are designed to increase the diameter of the pelvic inlet by employing all the mobility in the pelvic joints.

Acute trauma is a prolific cause of sacroiliac sprain. It may also be due to violent falls upon the buttocks; twisting falls, the result of slipping; the sudden placing of a heavy strain upon one leg, or of violent muscular effort on one side to regain the equilibrium.

A fact not widely recognized is that the sacroiliac joint may be exposed to undue strain in the course of abdominal operations if no provision is made for the support of the lumbar spine and the lumbosacral curve, or for the knees when the legs are straight. There is often considerable downward pressure on the pelvis by the operator or his assistants, and in the unconscious patient the strain of the sacroiliac articulation so imposed cannot be overcome by muscular action or support. Many persistent backaches following operation may be laid to this source. General diseases or conditions of wasting and ill-health may impair the muscular and ligamentous strength of the articulations in general, and since the sacroiliac joint is the one that bears the greatest strain, it may be affected first. Sacroiliac weakness is often present in patients exhibiting postural defects, obesity, muscle atrophy, general relaxation of the muscular tissues, or viscerotoposis.

Symptoms.—When the sacroiliac joints are taxed beyond their strength, the ligaments are overstretched, an osteo-arthritis of mild or severe grade may be set up, and every tax or strain upon the joint may become painful. The pain may be localized directly over the articulation posteriorly, on one or on both sides, corresponding to the lesion, or, by virtue of the intimate association of the lower part of the joint anteriorly with the lumbosacral cord, it may extend down the backs of the thighs (*sciatica*).

The pain in sacroiliac sprain is increased by any position or exertion that puts tension on the ligaments or that necessitates motion, however slight, of the joint. Bending the spine forward, backward, or to one side,

assuming the recumbent or the erect posture after lying flat on the back, rising from a chair, etc., are among the common movements that cause pain. The patient is usually most comfortable lying on the back with the thighs flexed and the lumbar curve supported by a pillow. In getting out of bed or rising from a chair the patient may turn to one side and use the arms to push the body up into the desired posture. Occasionally the prone position is uncomfortable and only a lateral posture may give relief.

Examination and Diagnosis.—In marked cases of sacroiliac sprains the diagnosis is easy, but in mild cases it may be difficult. The following tests may be made: With the patient lying supine, the leg and thigh, with the knee extended, of each side in turn is grasped by the hand and carried as far as possible over the abdominal surface (hyperflexion). Then, with the patient lying prone, the thighs are hyperextended. The patient is now placed on her left side; the sacrum and lower spine are grasped with the left hand of the examiner and fixed, while with the right hand the thigh is hyperextended. The same maneuvers are carried out on the opposite side. Massive per-

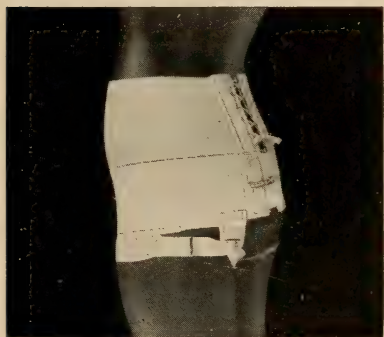


FIG. 452.—Storm's sacro-iliac belt.

cussion of the hip is performed at this time, using the fist of the right hand as the plexor, and the outstretched left hand, placed over the upper ilium and the ilio-femoral articulation, as the pleximeter. The patient now stands erect, with the knees fixed. She is directed to bend forward, backward, to the right, and to the left as far as possible, and to twist the body first to one side and then to the other. Direct pressure or percussion may now be made over the articulation itself. These movements are all designed to bring some tension to bear on the ligaments of the

sacroiliac articulation, or to produce motion in the joint. In case of a sore or sprained articulation, one or more of these movements will cause pain, the seat of greatest intensity corresponding to the affected articulation. Nevertheless, moderate degrees of sacroiliac sprain may be encountered in which, even after these tests have been made, the examiner may be uncertain as to how important a factor relaxation of this joint may be in the production of a given set of symptoms. Under such circumstances the therapeutic test will serve to differentiate pain due to sacroiliac sprain from that due to other causes. The treatment for the relief of sacroiliac pain should be applied and the effect observed.

Treatment.—The treatment of sacroiliac sprain consists in fixation of the joint. The degree to which this is desirable depends upon the severity of the lesion. For the severest cases, a plaster cast will be required. For those that fall into the hands of the gynecologist, fixation by means of a sacral pad and adhesive plaster straps, corsets, or braces will be sufficient. In suspected cases a pad may be placed over the sacrum, and a leather belt may be strapped tightly about the pelvis, care being taken to see that it envelops the bony pelvis and passes below the iliac crests; adhesive plaster

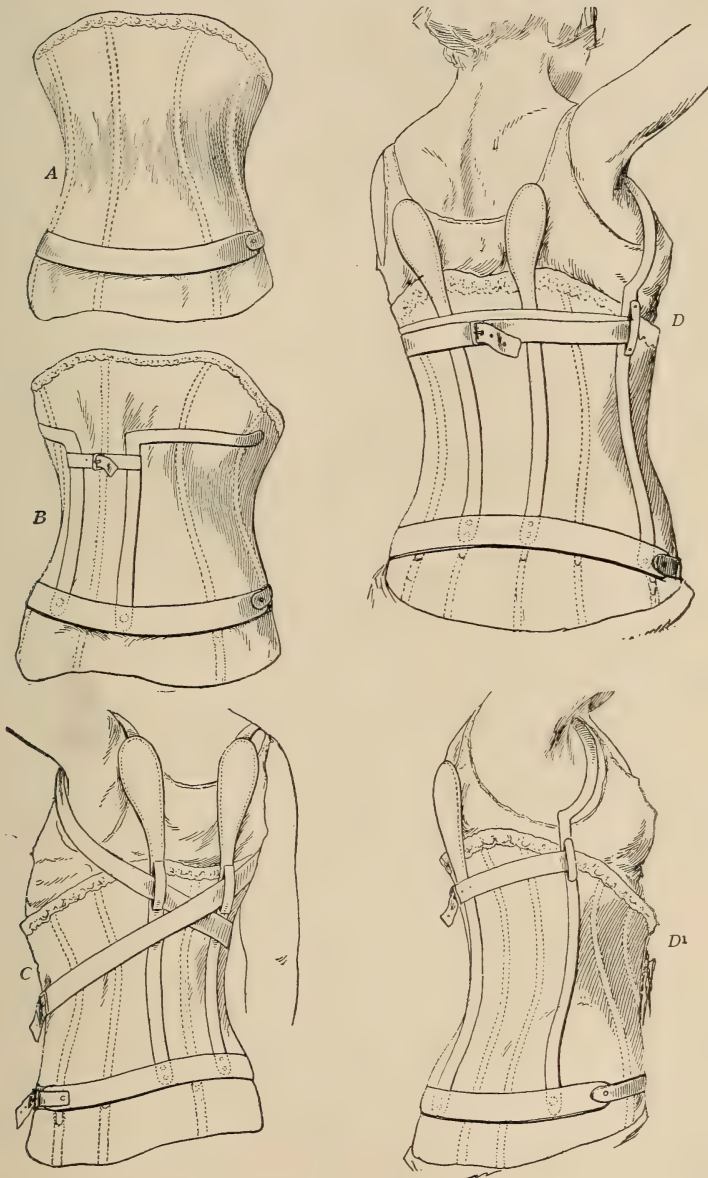


FIG. 453.—Merrill's sacroiliac splint.

B. Same as *A*, with the exception of the postero-lateral steel uprights, attached to corset, with straps for adjustment. *C.* Same as *A*, with posterior uprights and shoulder straps. *D* and *D*¹. Caliper splint. Same as *A*, with posterior uprights rigid and two lateral uprights movable, the latter adjusted by posterior straps. Upper ends lateral uprights pass in front of shoulders to force shoulder girdle backward, to give support to spine in direction of sagittal plane. Lateral bars adjustable by posterior strap.

may be applied with a similar object in view. Relief of pain may be almost immediate.

Should the therapeutic test be positive, the patient may be provided with a more permanent means of support in the form of a brace or a corset (Figs. 452 and 453), or a combination of the two. Sacroiliac sprains are often present in conjunction with static backache, relaxation of the abdominal parietes, and visceroptosis, so that treatment for the relief of the painful articulation must be combined with that of the other condition present. Thus a brace may be combined with a corset that corrects a habitual faulty posture of the patient or that supports the lower abdomen and ptotic viscera.

Prognosis.—As a rule, the prognosis of sacroiliac sprains is good. The ultimate result depends upon the degree of the injury, the thoroughness of the treatment, and the general health of the patient. In severe cases complete fixation by means of a plaster cast does much to insure a satisfactory outcome.

TOXIC ARTHRITIS

An actual inflammation of the articular cartilages and ligaments of the vertebral, lumbosacral, or sacroiliac joints may be the source of persistent backache. It is caused by a deportation of bacteria from distant foci of infection, particularly from the teeth, tonsils, and nasal sinuses. Toxic arthritis is usually engrafted upon chronically congested and strained joint surfaces. This condition must always be suspected in rebellious cases of static backache or sacroiliac sprain. The symptoms persist in spite of correction of posture and the wearing of suitable corsets, braces, and shoes. As a rule, the lower spine and sacroiliac joints are particularly tender and the symptoms out of proportion to the degree of postural defect. There may be no history of acute trauma, such as follows a fall or labor. The condition may arise without any previous indication of static or sacroiliac disability.

The treatment of toxic arthritis is the treatment of static backache or of sacroiliac sprain, plus the localization and eradication of foci of infection in the teeth, tonsils, nasal sinuses, and gall-bladder.

PENDULOUS FAT ABDOMEN; RELAXED ABDOMINAL WALL

An excessively fat and pendulous abdomen is a frequent source of distress to women past middle age (Fig. 454). It may be the result of insufficient exercise combined with errors in diet; it may be an evidence of a diminution of the ovarian secretion as observed in the premature, artificial, or natural menopause. The exact cause is often undeterminable. Apart from the æsthetic reasons for which the patient may seek relief, the overhanging fat is a source of annoyance and results in maceration and low-grade inflammation of the skin beneath it.

In a large proportion of cases the pendulous accumulation of fat is associated with and undoubtedly aggravates the symptoms of insufficiency of the abdominal wall, separation of the rectus muscles, and ventral hernia. Under such circumstances, the condition ceases to be a mere cosmetic defect, and requires attention because of the part it plays in the production of symptoms. If the latter are treated surgically and no attention is paid to

the fat, the result may be unsatisfactory, because of the fact that a contributing factor to the discomfort of which the patient complained has been left undisturbed.

The intelligent and well-to-do woman will overcome an unwelcome addition to her girth by the use of a suitable corset or an abdominal binder. A properly fitted straight-front corset will elevate and support the pendulous folds. If the accumulation of fat is associated with relaxation of the abdominal wall, such a corset or binder will also relieve the symptoms of abdominal insufficiency. It is absolutely necessary, however, that careful attention be given

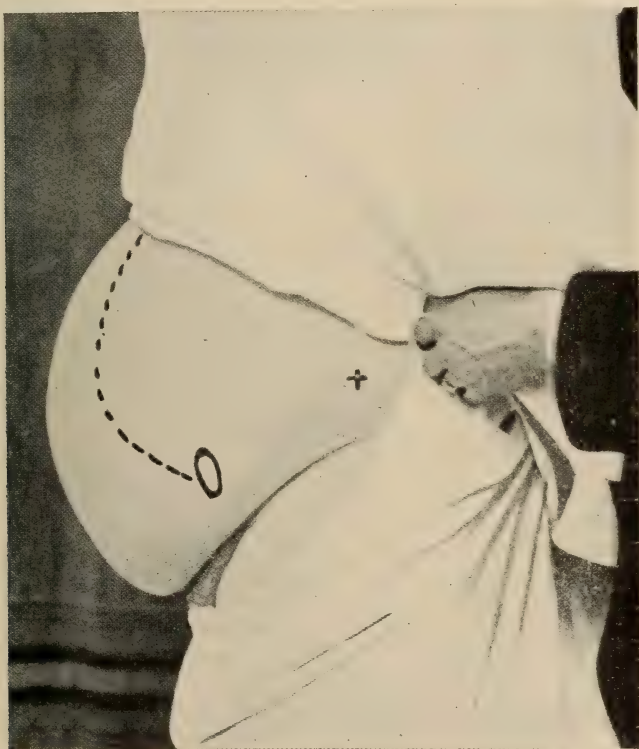


FIG. 454.—Fat overhanging abdomen; + marks anterior superior spine.

the application of the corset, and that it be renewed from time to time. A corset of this sort is above the average in cost, since it must often be constructed especially for the patient. The carrying out of these measures for the correction of the defect by the use of a corset means the expenditure of time, money, and care.

Surgical treatment, on the other hand, offers a speedy relief. If the pendulous fat is not associated with relaxation of the abdominal wall, hernia, or an intra-abdominal disease that requires operation, resection becomes a very simple matter, requiring but brief anæsthesia, and an operation that is practically free from danger. When the fat is associated with

other lesions requiring operation, its resection involves no added risk and consumes but a few extra minutes.

The lines of excision should be transverse. The flaps of fat should be brought together with interrupted sutures, and the wound should be drained at each angle for twenty-four hours.

COCYGDYNIA

Coccygodynia is the term applied to painful sensations originating in the region of the coccyx, and produced by lesions of its constituent bony segments and the joints between them or the sacrococcygeal articulation. The exciting cause is an injury to the coccyx affecting the continuity of its bony segments or its joints. Solution of continuity takes place most commonly in labor, the foetal head, in its passage through the pelvic outlet, over-extending the sacrococcygeal articulation with resulting fracture of its bones or rupture of its joints. Other causes may be operative, such as kicks or falls, the trauma being received directly upon the bone, with resulting osteitis and pericoccygeal cellulitis.

Symptoms.—The symptoms consist of pain in the affected area when sitting, or especially in rising after being seated, the pain being brought about by muscular action that pulls upon or moves the coccyx. The pain may be excited, also, by defecation. The patient commonly sits more upon one buttock than upon the other, so that the weight rests on one ischial tuberosity and does not reach the coccyx. In rising from the sitting posture the patient assists herself by using the hands and arms, pushing herself up from the seat or along the back of the chair. The pain may be of a more indefinite type also, occurring now and then, and apparently not depending upon any particular or special muscular effort.

Diagnosis.—The diagnosis can usually be established by making a combined examination of the coccyx with a finger in the rectum and the thumb over the coccygeal raphé. Abnormal mobility with exacerbation of the pain, marked deformity of the coccyx, with ankylosis, and thickening of the articulation may be found. If no striking abnormality is discovered, and the symptoms complained of do not manifest themselves as the result of the examination, one must be wary of ascribing the symptoms to the coccyx, or of expecting a cure to follow its removal.

Treatment.—The treatment consists in removing the coccyx, although palliative measures, such as counter-irritation and the exhibition of salicylates, may afford temporary relief. A median incision is made directly over the coccyx through the raphé, from the tip to the point of its articulation with the sacrum. The surface of the bone is freed up past the sacral joint. With heavy, blunt-pointed scissors it is then cut loose from its attachments all around. After the bone is entirely freed, it should be grasped with a sequestrum forceps, bent forward at the coccygeosacral junction, and the ligaments of the joint divided with a heavy knife; bleeding vessels should be ligated and the wound closed with interrupted sutures of silkworm gut. A strip of rubber dam may be left in the lower angle of the wound for twenty-four hours to insure sufficient drainage.

BIBLIOGRAPHY

- DICKINSON, R. L.: "Toleration of the Corset, Prescribing Where One Cannot Proscribe." *Am. Jour. Obst.*, 1911, lxiii, No. 6.
- DICKINSON, R. L., AND TRUSLOW, W.: "Averages in Attitude and Trunk Development in Women and Their Relation to Pain." *Jour. Am. Med. Asso.*, 1912, lix, 2128.
- GOLDTHWAITE, J. E.: "The Relation of Posture to Human Efficiency and the Influence of Poise Upon the Support and Function of the Viscera." *Bost. Med. and Surg. Jour.*, 1909, clxi, 839.
- LITZENBERG, J. C.: "Sacroiliac Joints in Obstetrics and Gynecology." *Trans. Sect. O., G. and A. S., A. M. A.*, 1917, 93.
- LOVETT, R. W.: "The Causes and Treatment of Chronic Backache." *Jour. Am. Med. Asso.*, 1914, lxii, 1615.
- MEISENBACH, R. O.: "Sacroiliac Relaxation, with Analysis of Eighty-four Cases." *Surg., Gynec. and Obst.*, 1911, xii, 411.
- REYNOLDS, E., AND LOVETT, R. W.: "An Experimental Study of Certain Phases of Chronic Backache." *Jour. Am. Med. Asso.*, 1910, lvi, 1033.
- SMITH, R. R.: "Enteroptosis with Special Reference to Its Etiology and Development." *Jour. Am. Med. Asso.*, 1910, lvii, 1860; *Ibid.*: "A Study of Children with Reference to Enteroptosis." *Jour. Am. Med. Asso.*, 1912, lviii, 385.
- WETHERILL, H. G.: "Subinfection from Foci in the Pelvis and Abdomen." *Trans. Sect. O., G. and A. S., A. M. A.*, 1915, 172.

CHAPTER XXIX

GONORRHOEA

General Peculiarities.—The initial symptoms of gonorrhœa are prone to be less acute in the female than in the male, and the disease is, therefore, more insidious in the former. It is also capable of producing more harm and its ravages frequently lead to chronic invalidism or even to death. The frequency of gonorrhœa in the female is difficult to estimate, since it varies greatly in the different classes of society. Johnson reports that in 1901 the Section on Hygiene and Sanitary Science of the American Medical Association sent the following question to many of the leading gynecologists in this country and in Europe: "What is the proportion of cases of pelvic inflammation coming under your care which are attributable to gonorrhœal infection?" The general average of the proportions given was 40 per cent. Noeggerath first drew attention to the frequency and the seriousness of the disease in women. He believed that eight out of every ten married men in New York city had been infected with gonorrhœa before their marriage, and that a majority of them subsequently infected their wives. While this is undoubtedly an exaggeration, it is nevertheless probably true that no single disease of the genital organs causes half so much suffering, mutilation, and direct mortality as gonorrhœa. Bumm estimates that one-third of the cases of sterility in women is due to the gonococcus. The number of instances of race suicide due to this disease, if it could be ascertained, asserted Johnson, would equal the number of lives lost from pneumonia, tuberculosis, or typhoid fever, or perhaps from all these combined.

The gonococcus is a peculiar organism. While it is extremely hard to grow upon culture media, and is incapable of producing gonorrhœa in animals, it is nevertheless one of the most difficult organisms to eradicate from the generative organs of women once they have been infected. As compared with the streptococcus, the gonococcus has little power of penetration. Its influence upon the cutaneous surface or the modified skin covering of the vagina or the vulva is but slight. Within glandular structures, however, it produces a serious, persistent inflammation that manifests but little tendency to undergo spontaneous cure. Wertheim has shown that the gonococcus does not affect the mucous membranes solely, but occasionally invades and becomes embedded in other tissues, where it grows and produces a reaction. Thus the organism may rarely be the cause of parametritis. It has also been found in the wall of the Fallopian tube, at a considerable distance from the mucosa. Gonorrhœal arthritis and gonorrhœal endocarditis are further evidences of the truth of Wertheim's assertion. A peculiarity of the transmission of gonorrhœa is that infection from an old gleet discharge (morning drop), when no acute symptoms have occurred and the incumbent is perhaps unaware of the true condition, may produce a gonorrhœa of the most virulent form in a second person. Again, married persons infected

with the gonococcus may become more or less immune to their own particular organism, so that the symptoms and signs of the disease may subside completely. If these persons live apart from each other for a considerable period of time, upon resuming sexual intercourse a violent gonorrhœa may be set up in either individual, although both have been virtuous during their separation. Or if the infection is transferred from a married couple to a third person and then again to one of the original incumbents, it is capable of producing a violent attack.

Latent and Residual Gonorrhœa.—Chronic gonorrhœa may exist in an individual without producing noticeable symptoms. Under such conditions the host may be entirely unaware of its existence until, following some unusual irritation of the sexual organs, it reappears in an acute or in a sub-acute form. This fact was first noted by Noeggerath, who spoke of it as "the latency of gonorrhœa." Luther believes that a more nearly correct phrase would be "the latency of the gonococcus." Fritsch speaks of gonorrhœa without symptoms. Residual gonorrhœa is a chronic affection, which, as Saenger asserts, depends less upon the presence and the activity of the gonococcus than upon the tissue changes produced by the organism during a previous infection.

Symptoms.—Gonorrhœa in the female does not pursue so virulent an initiative course as it does in the male. Indeed, in an uncleanly woman or in one of sluggish habits the disease may exist for some time before the patient is aware of it. This is due to the fact that the urethra in the female, being short and not surrounded by erectile tissue, as in the male, an inflammation of the mucous membrane is not so painful and difficulty in urination is not so marked. Furthermore, in the female, gonorrhœa is not necessarily first localized in the urethra, but may occur primarily in the cervix or in the vulvovaginal glands—in either situation it is less likely to produce acute initial symptoms than when it occurs in the urethra. Occasionally, either because the infection is highly virulent or the affected parts are unusually susceptible, gonorrhœa does produce severe initial symptoms. In such cases, in addition to a violent local reaction in the affected parts (see urethritis, page 440; vulvitis, page 167; endocervicitis, page 223), slight constitutional disturbances may be present.

The urethra is the seat of an initial attack of gonorrhœa more often than are the glands of Bartholin or the cervix. For this reason the symptoms at the onset of a gonococcus infection in women are often vesical. The patient complains of frequent and painful urination, a burning pain about the external urinary meatus, and a leucorrhœal discharge. It is a grave mistake at this time to make a vaginal examination or to introduce a speculum unless there is a leucorrhœal discharge from the vagina. If the vulva is carefully cleansed with pledgets of cotton, and the lips of the smaller labia are separated so that the vaginal introitus is exposed to view, the presence of a vaginal discharge can at once be detected. In cases of doubt it is better to permit a cervical nidus of infection to go untreated for a short time than to run the risk of infecting a healthy cervix by making an examination or carrying out a treatment inside the vaginal orifice. In the subacute or in the chronic stage of gonorrhœa the infection is frequently

localized in the glands of Skene, the glands of Bartholin, and the cervix. At this time there very often appear, at the urinary meatus (Skene's tubules) and about the orifices of the ducts of the vulvovaginal (Bartholin's) glands, small areas that resemble flea-bites in appearance. These are known as the *maculæ gonorrhœica*, or gonorrhœal macules. They may be found also in the posterior vaginal fornix when the cervix is the seat of gonorrhœa and the posterior vaginal fornix is constantly bathed with gonorrhœal pus. In old cases of gonorrhœa all gross evidences of the disease may disappear from the external genitalia and the cervix, although the disease may still be present and be capable of infecting another person. The discharge from the glands of Skene, from Bartholin's glands, and from the cervix, though it appears as only a small amount of turbid mucus, will sometimes show the gonococcus. Under such circumstances it may be necessary, in making a search for the gonococcus, to examine smears taken at different times between the menstrual periods; occasionally the organism will be found in the cervical discharge only preceding or following a menstrual period.

From what has been said it will readily be seen that in the chronic latent forms of gonorrhœa a woman can, by careful douching, etc., remove all gross evidences of the disease. Physicians should make it an unvarying practice to instruct patients not to use a douche before coming for examination. Unless such instructions are given, most women, from motives of cleanliness, will take a douche immediately before consulting a physician. The other structures affected by gonorrhœa are the vagina, the endometrium, the Fallopian tubes, and the pelvic peritoneum. The disease is considered under the sections that deal with these structures.

Diagnosis.—Brose and Schiller believe that the recognition of the gonococcus in smears is not necessary for confirming the diagnosis of gonorrhœa. The coincident infection of the urethra, Bartholin's glands, and the cervix, and especially the presence of gonorrhœal macules at one of these situations, are sufficiently significant to warrant a diagnosis. Neisser and his pupils insist upon the recognition of the gonococcus, and this is important if it is desired to establish the diagnosis for forensic purposes.

The Technic of the Preparation and the Examination of Smears for the Gonococcus.—In the preparation of smears for the detection of the gonococcus it is important to avoid the transference of infectious matter from one point to another. For this reason the platinum wire, or the applicator, or whatever instrument is used to transfer the suspected discharge to a glass slide, should be carefully wiped clean and sterilized in an alcohol flame after each smear is made. The glass slides should be well cleaned before using, and each one should be labelled immediately after it is prepared. The smears must be made very thin. Glass slides are preferable to cover-glasses. If the smears are contaminated with a lubricant of any kind—vaseline, glycerine, etc.—they will not stain well; hence, in making the smears care should be taken that the physician's hands be free from these substances. It is unnecessary to obtain smears from the vulva or the vagina, except in cases of actual vulvitis or vaginitis in young children. Under such circumstances it would be difficult to procure the discharge, as

is done in the adult, from the cervix, the urethra, and the vulvovaginal glands, and for that reason the platinum loop may be scraped along the vulvar surface or passed directly into the vagina (Fig. 455).

At least three hours after the passage of urine and twenty-four hours following the use of a vulvar or vaginal douche the patient should be placed in the dorsal position upon an examining table, and the external genitalia exposed to view. The entire vulva should be gently wiped free from discharge. The forefinger of the left hand should be introduced into the vagina and the palmar surface turned upward. The contents of the urethra are now expressed by drawing the finger forward and pressing it steadily against the floor of the urethra. The end of a platinum wire or an applicator is used to transfer a portion of the mucopus to a glass slide. In chronic cases it may be necessary to strip the urethra several times in order to secure a sufficient quantity of discharge. In such cases, too, the excretion from Skene's tubules is more prone to contain the gonococcus than is the secretion from the urethra itself. The orifices of Skene's tubules are about 2 mm. within the urinary meatus, on the floor of the urethra. In the parous woman, in whom there is some eversion of the meatus, these orifices can readily be



FIG. 455.—Smear of pus from urethra (u), vagina (v), and cervix (c).

seen; in nulliparæ the lips of the meatus must be slightly everted in order to expose the orifices. To collect the discharge from the ducts themselves the end of a straight platinum wire should be passed directly into them, or they may be stripped, in the manner previously described for the urethra.

Practically it makes no essential difference whether the gonococcus is found in the urethra or in Skene's tubules, and the discharge from the tubules may be collected together with that from the urethra. In chronic cases, however, the urethra may be entirely free, whereas the tubules will be the seat of a chronic infection. Even a small amount of thin, yellowish-white discharge may contain large numbers of gonococci.

The secretion of the vulvovaginal glands should next be secured by gently compressing the glands, first on one side and then on the other, between the thumb and forefinger. In doing this the forefinger is introduced just within the vaginal orifice. A smear may also be taken by passing a straight platinum wire directly into the duct of the gland.

Smears from the cervix are taken by exposing the part with a bivalve speculum. The portio vaginalis and vaginal cervix are thoroughly cleansed of discharge, and the platinum wire or applicator is introduced

into the cervical canal, care being taken not to pass the limits of the internal os. The loop of the platinum wire or the applicator should be made to engage the folds of the cervical mucosa at the circumference of the cervical canal. In this way one is more apt to find lurking gonococci. The slides should be fixed and stained as described on page 128. For the detection of the gonococcus an oil-immersion lens will be required. As a rule, if the discharge is purulent and the smears show myriads of bacteria, the gonococcus will not be found. A number of cocci that slightly resemble the gonococcus may confuse the beginner and give rise to error. When the gonococcus is present, it can usually be recognized from its form or from its position within the epithelial or the pus-cells. If the investigator is unaccustomed to bacteriologic work, it is well for him to have at hand a type specimen of the gonococcus, and to compare it with the specimen for diagnosis.

Prognosis.—If the disease is carefully treated during the initial stages,

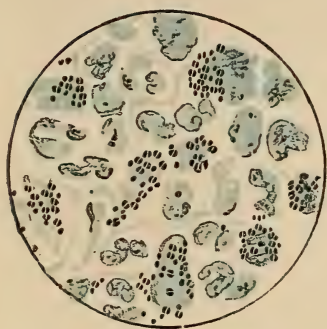


FIG. 456.—Appearance of gonococci in stained preparation.

and if reinfection can be prevented, the prognosis is favorable. In old cases, where the disease has persisted either as the result of insufficient or of careless treatment or because of repeated infection, the prognosis is doubtful. Much depends, of course, upon the organs involved. Once the disease has passed into the uterine cavity or into the Fallopian tubes, cure becomes difficult. Gonorrhœal salpingitis or pyosalpinx usually demands operation. Even after both tubes have been removed in cases of bilateral pyosalpinx a gonococcal infection may persist in the endometrium, cervix, vagina, and vulvovaginal and Skene's glands. This is, how-

ever, rare, most cases recovering entirely after a radical operation if proper medical treatment of those foci of infection has been instituted.

Prophylaxis.—Much has been written upon the subject of prophylaxis. Some of the plans suggested for preventing the spread of gonorrhœal infection have failed signally, whereas others are clearly impracticable. The segregation of prostitutes and the examination of them at regular intervals has not been entirely satisfactory. This failure is due partly to the fact that a woman with chronic gonorrhœa can often, by employing cleansing douches, etc., conceal her condition from the physician unless a painstaking examination is made and the patient is observed for a length of time and under certain conditions that have been discussed elsewhere. The same is equally true of the male. It has been suggested that marriage should not be permitted to take place until a careful examination of the male by a physician shows him to be perfectly sound. Such a plan is at present to a great extent impracticable. Both sexes should, however, be told of the serious nature of the disease and should be made to feel its dangers and the responsibility of transmitting it to others. If the truth about gonorrhœa were commonly known, few males who were at some time incumbents of the disease would marry without seeking professional advice. A knowl-

edge of the suffering and the dangers incident to gonorrhœa would also go far toward discouraging intercourse in the infected and unmarried. For the details of the treatment of urethritis, vulvitis, vaginitis, endocervicitis, endometritis, salpingitis, peritonitis, etc., caused by the gonococcus, see the chapters devoted to these subjects.

BIBLIOGRAPHY

- BUMM: "Die Mikro-organisms gonorrhöischen Schleimhauterkrankungen." Wiesbaden, 1885; *Ibid.*: "Die gonorrhöischen Erkrankungen der weiblichen Harn und Geschlechtsorgane." Veit's Handbuch der Gynäkologie, Bd. 1.
- MENGE: Handbuch der Geschlechtsk., Vienna, 1910.
- NEISSER, A.: "Über Eine der Gonorrhœ eigentümliche Micrococcusform." Cent. f. d. med. Wissens., July 12, 1879, 32; *Ibid.*: "Die Mikrokokken der Gonorrhœ." Deutsche med. Woch., 1882, xiii, 279; *Ibid.*: "Forensische Gonorrhœefragen." Aertzl. Sachverst. Zeit, 1895, No. 12.
- NOEGGERATH, E. J.: Die latente Gonorrhœ im weiblichen Geschlecht. Bonn, 1872.
- NORRIS, C. C.: Gonorrhœa in Women. Saunders, Phila., 1913.
- WASSERMANN, A.: "Über Gonokokken-Cultur und Gonokokken-Gift." Berlin klin. Woch., 1897, No. 32, 685; *Ibid.*: "Über Gonokokken-Cultur und Gonokokken-Gift." Verhand., Berl., Ärztlicher Med. Gesellschaft, Berlin klin. Wochenschr., 1897, No. 32, 700.
- WERTHEIM, E.: "Zur Frankfurter Gonorrhœ-Debatte." Cent. f. Gyn., 1896, No. 48, 1209.

CHAPTER XXX

TUBERCULOSIS OF THE GENERATIVE ORGANS

TUBERCULOSIS may affect any part of the genital tract, but its most frequent site is the Fallopian tube. The latter is found to be affected in about 90 per cent. of all cases of genital tuberculosis. Very frequently the peritoneum is infected coincidentally with involvement of the tube. In 194 cases of secondary tuberculosis of the tube the peritoneum was involved in 110. The next most frequent site of genital tuberculosis is the fundus of the uterus; the cervix is seldom involved. The ovaries are not often invaded. Tuberculosis of the vagina is exceedingly rare, and tuberculosis of the vulva is the most uncommon variety.

The incidence in general of tuberculosis of the generative organs in woman is about 1 per cent. This proportion has been determined by post-mortem examination; 1 per cent. of all autopsies in females showing tuberculosis of the genital tract. According to Berkeley, in tuberculous women there is tubercular disease of the pelvic organs in 7.7 per cent. According to Freriche, Turner, and Stopler, tubal tuberculosis occurs in from 12 to 20 per cent. of tuberculous women. The proportion of pyosalpinx that is due to tuberculous infection is given by various authors as ranging from 3 to 10 per cent. Grange reported that in 20 per cent. of all cases of tuberculosis of the female generative tract coming to autopsy at the St. Georg Hospital at Hamburg, the age of the patient was under fifteen; the greatest number occurring the first and the fifth year and the next largest between the tenth and the fifteenth year.

Schlimpert found the greatest incidence (32.9 per cent.) between the ages of twenty-one and thirty, and 17.8 per cent. between thirty-one and forty, and 17.8 per cent. between forty-one and fifty.

Tuberculosis of the generative organs is usually secondary to a nidus of tuberculous infection elsewhere in the body. The genital tract is affected secondarily, the disease reaching the tract by the metastatic deposit of tubercle bacilli from the blood-stream. This is the most frequent mode of infection. The next most common mode of infection is by direct extension from a neighboring organ, as, for example, from the peritoneum to the tube.

In rare instances tuberculosis of the genital organs may be primary, but in order to establish the diagnosis positively, a complete autopsy must have failed to show a primary focus of infection elsewhere in the body. A primary infection may, however, occur as the result of direct inoculation of tuberculous material during coitus, examination, and instrumentation. Since primary tuberculosis of the vulva, vagina, and even of the cervix, is so exceedingly rare, the occurrence of a primary direct infection has been doubted. It is probable, however, that the vulva and vagina are more resistant to this infection than are the parts higher up.

The anatomic manifestations, as well as the symptoms and diagnosis of

genital tuberculosis, vary according to the parts that are involved. The disease may, therefore, be considered, as it affects the individual parts, bearing in mind that in advanced cases the entire generative tract may be involved.

TUBERCULOSIS OF THE TUBES

Pathology.—As a rule, both tubes are affected. A preliminary inflammation or catarrh of the mucosa favors the development of tuberculous salpingitis. Faulty development or hypoplasia of the genitalia is a predisposing factor. Not infrequently it has its inception during the puerperium. At first the bacilli lodge in the mucosa, in which they produce the typical tubercles that sooner or later become necrotic and then caseate. Later calcareous infiltration of the caseated areas may take place. These changes vary in extent and in degree. Thus in one case the mucosa alone may be affected, whereas in another the muscular and serous layer also are invaded. The outer part of the tube is usually the portion most extensively affected, and shows the greatest increase in diameter. The lesions may, however, be most marked toward the isthmus, in which case general distention of the tube is not so marked as is the formation of discrete nodules or nodular thickenings.

The abdominal ostium may be open or closed, and the tube may or may not be adherent to the surrounding structures. It is usually abnormally convoluted, and shows a certain stiffness and hardness. It varies in diameter from that of a lead-pencil to that of a finger or thumb; some of the largest pyosalpinges ever observed have been tuberculous. The contents usually consist of a grayish-yellow, cheesy material, in which areas of calcareous deposits may be seen. In large tuberculous pyosalpinges the contents may be somewhat fluid and resemble the whitish-yellow suppurative material of a tuberculous abscess elsewhere. After removal of the contents the inner surface of the tube may exhibit small, grayish-yellow tubercles. The tubal wall itself is usually more or less thickened, and if the serous coat is involved, the surface is dotted with the small, grayish-yellow tubercles.

The secondary form of tuberculous salpingitis is believed to run a more acute course than the primary form, the abdominal ostium remaining open comparatively longer, and adhesions to surrounding structures occurring relatively late. There is also more likelihood of the muscular layer becoming involved. The primary form runs a more chronic course, the abdominal ostium closing early, considerable enlargement of the tube taking place, and adhesions being widespread. In some of the more chronic cases there is a rich overgrowth of fibrous connective tissue and but little tendency to break down is manifested. The three forms described by Williams as miliary, chronic diffuse, and chronic fibroid are regarded respectively as the beginning stage of the tuberculous process, the advanced form, and the variety in which there is an overgrowth of connective tissue.

It is important to remember that cases of tuberculosis are encountered that are not even remotely suggestive of a tuberculous process. They resemble closely the ordinary suppurative conditions, and only by making microscopic and bacteriologic examinations can the true nature of the dis-

ease be recognized. Other cases are seen in which the diagnosis can be made only as a result of a bacteriologic examination, and identification is possible only after stained tubercle bacilli have been recognized in the pus.

Infection of the peritoneum from the tube occurs either through the abdominal ostium or by direct passage of the infection through the tubal wall. Tubal tuberculosis may extend to the endometrium. Only rarely does it attack the ovaries, the vagina, and the vulva. In the presence of a mixed infection a tuberculous salpingitis may be attended with suppuration.

Symptoms.—The symptoms of tuberculous salpingitis may in no way be distinctive. A salpingitis occurring in a young virgin may be suspected of being of tuberculous origin. Salpingitis occurring secondary to a focus of tuberculous disease elsewhere in the body, without a history of possible gonorrhœal or septic infection, should be examined carefully for evidences of a tuberculous nature.

Probably the most common symptoms are tenderness and pain. A general ill-defined soreness, interrupted by attacks of acute pain, not so severe as in the usual form of salpingitis or peritonitis, with elevation of temperature, rigidity of the lower abdomen, etc. After the attack passes off—which may occur within a week or ten days—the uterus and adnexa are less likely to be fixed than after gonorrhœal salpingitis or ordinary pelvic inflammatory attacks of septic origin. The enlargement of the tubes may readily be recognized, and in some cases, especially when the isthmus of the tube is chiefly involved, with the development of localized thickenings, a rosary-like formation can be outlined. Sterility is the rule. No constant effect of the disease on the menstrual periods has been noted. Fever of a regularly remittent type may be present. Some vesical irritability is often observed. The general health may fail, and a leucorrhœal discharge may be present.

When, in addition to the tuberculous salpingitis, the peritoneum is involved, and there is a tuberculous peritonitis of the disseminated serous variety, diarrhœa, pain and tenderness of the iliac fossæ, and enlargement of the abdomen may supervene. Examination may not disclose anything characteristic of a tuberculous disease. The nodular condition of the isthmus of the tube, believed by some investigators to be characteristic of tuberculosis, has been known to exist in gonorrhœal lesions. The infiltration and exudate found in the ordinary gonorrhœal and septic cases are more marked than in those of tubercular origin, except in the later stages, when the changes have been extremely marked.

When peritonitis accompanies the tubal disease, ascites may be present. The collection of fluid in tuberculous peritonitis is often more or less localized, and may be so completely localized as to form a tumor that resembles an ovarian cyst. The collection of fluid may be situated in the center of the abdomen or to one side. Movable dulness is less likely to be present than in other forms of ascites.

Treatment.—The only treatment that can be considered is complete extirpation of the tubes. This is done preferably through an abdominal incision, the ovaries and uterus being spared if possible.

TUBERCULOSIS OF THE PERITONEUM

Pathology.—Tuberculosis of the peritoneum is considerably more common in the female than in the male. The ratio is about three to one. In females the peritoneum is most frequently infected from the tubes. The tubercle bacillus also reaches the peritoneal cavity through the intestine, into which they have been introduced through the medium of infected milk or meat. The intestine may be involved primarily and the peritoneum secondarily, or the bacilli may pass through the intestine without causing any lesion and attack the peritoneum primarily. Bacilli may be deposited also through the blood current from the mesenteric glands or the pleura. Four varieties of tuberculosis of the peritoneum have been described by Murphy: (1) The most usual one, the ascitic or serous variety, also known as disseminated, miliary, and non-confluent tuberculosis; (2) the adhesive, cystic, or obliterative variety; (3) the nodular, ulcerative, or perforative variety; and (4) the suppurative, circumscribed, or general mixed infection.

As has been stated, the ascitic is the most common variety. The peritoneum presents a congested appearance, with here and there gray fibrous plaques and fresh deposits of miliary tubercles, most numerous near the ends of the tubes. Cheesy material may be seen escaping from the tube. In the adhesive variety the endothelial lining of the peritoneal cavity is destroyed, and connective-tissue products are formed that result in cyst formation and isolation of certain areas in the peritoneal cavity. There is considerable agglutination between adjacent intestinal walls and the peritoneum. In the ulcerative form the tuberculous process has been most destructive, and the involved intestine, mesentery, or pelvic organs are destroyed, and are represented by caseous masses surrounded by "dense connective-tissue barriers and adhesions" (Murphy). Tuberculous peritonitis with mixed infection may take the form of any of the three varieties just described, plus infection by other organisms.

Symptoms.—The symptoms of tuberculous peritonitis may come on very slowly or appear suddenly. There are tenderness and pain in the pelvis or lower abdomen, diarrhoea, and attacks of exaggerated pain combined with nausea and vomiting. The general health may be considerably disturbed. The menses may or may not be affected. The temperature may be subnormal in the morning, and elevated in the afternoon. The abdomen enlarges, and the patient becomes pale and emaciated. On abdominal examination the findings vary. Ascites may be present, which gives the impression of being encysted. The area of fluctuation may take in almost the entire abdomen, be limited to the region below the umbilicus, or it may be confined to one or the other hypogastric region. "Plaque-like thickenings of the deeper parts of the abdominal wall" (Murphy) were pointed out by Edebohls as a sign of great value in making an early diagnosis of peritoneal tuberculosis without ascites. The skin may take on a deep brown, discolored appearance. The abdomen may feel "doughy" to the palpating hand. The pain and tenderness may undergo periodic exacerbations, with leucocytosis, elevation of temperature, increased pulse, nausea, and vomiting. These attacks are especially prone to be repeated in the disseminated variety, and are due

to an outpouring of tuberculous material from the tubes. The attacks last from eight to fourteen days, and bear some resemblance to attacks of appendicitis, except that the remission is not complete, and an unusual sensitiveness continues.

In the more advanced cases, when the tubes are closed and sealed off, the pain is irregular and sharp attacks do not occur. There is more continuous pain and tenderness, with recurrent seizures of colic and slight elevation of temperature. In the fibrous variety the circumscribed cysts are a more or less prominent feature, and when present in the pelvis are frequently mistaken for cysts of the broad ligament. Irregular cystic collection involving almost any part of the abdominal cavity may also be present. "In the mixed infection cases, there may be chills, pronounced elevation of temperature, diarrhoea, and rapid emaciation" (Murphy). The distinguishing features between the tuberculous and the ordinary varieties of general peritonitis are dependent largely upon the history.

Treatment.—The treatment of tuberculous peritonitis should be directed toward removal of the tuberculous focus, if that is possible, as it is when the tuberculous lesion of the peritoneum is secondary to a tuberculous infection of the tubes or the appendix. In addition to removing the focus of the disease, tuberculous ascites or exudates must be evacuated. Care should be taken during the progress of the operation not to add another source of infection, and a certain amount of reaction in the peritoneum is desirable as the result of the laparotomy, in order to produce tissue proliferation which may overwhelm and encapsulate the tuberculous peritoneal deposits. When the disease is so far advanced that actual destruction of the pelvic viscera has occurred and the intestines are very extensively involved, laparotomy can do little more than definitely determine the diagnosis.

TUBERCULOSIS OF THE ENDOMETRIUM

Pathology.—Tuberculosis of the endometrium is next in frequency to tuberculosis of the peritoneum. The lesion is usually secondary to a similar process in the tubes. The endometrium about the tubal orifices is most frequently invaded. The endometrium is believed to be somewhat protected against tuberculosis by the regular monthly anatomic changes that take place in its structure. Tuberculosis is more frequent before puberty and after the menopause. The disease may be found in the early stage, when it is marked by small, scattered tubercles, or in a later stage, when the tubercles have undergone necrosis and caseous degeneration; when the condition is more advanced, there may be considerable involvement of the muscular coat of the uterus, so that the diseased uterus may be represented merely by a fibrous bag containing caseous material, or the caseous material may undergo secondary infection, with the formation of a pyometra.

In the early stages there may be no enlargement of the uterus, but in advanced cases considerable enlargement may take place. The disease appears to be more frequent in multiparæ, and at times the onset of the disease can be traced back to the puerperium. The formation of thrombi at the

placental site is believed to furnish an attractive resting-place for tubercle bacilli in the circulation. A tuberculous placenta may be the starting-point, and it is well known that a latent tuberculous process frequently lights up during pregnancy and the puerperium.

Symptoms.—The symptoms are not pathognomonic of the condition, although the most frequent manifestation is a profuse and stubborn leucorrhœa. This symptom, when it occurs before puberty and after the menopause, may be particularly significant. The menstrual function may be normal, or scanty or profuse menstruation, or even amenorrhœa, may be observed.

Treatment.—Whenever tuberculosis of the endometrium is strongly suspected, curettement should be performed immediately. As soon as the diagnosis is made, unless the disease is discovered in the very early stages, and the tuberculous process appears to be limited to the superficial parts of the endometrium, panhysterectomy is indicated. For these cases discovered in



FIG. 457.—Tuberculous pyosalpinx with torsion of ovary and tube. (University Hospital.)

the earliest stage curettement may suffice. If the uterus is removed, both tubes should likewise be extirpated. One or both ovaries should, if possible, be allowed to remain.

TUBERCULOSIS OF THE OVARY

Pathology.—Tuberculosis of the ovary is somewhat infrequent. Ovarian involvement occurs in less than one-third of the cases of genital tuberculosis. Some authors report the percentage to be as low as 12.6. In one or two reported cases tuberculosis of the ovaries appears to have been primary in origin. Infection may be hæmatogenous, or occur by direct extension from the Fallopian tubes and peritoneum. The latter is the commonest route. The infection may also be carried to the ovary by way of the lymphatics. Tuberculosis of the ovary resembles tubercular infection of the testicle. In the early stages the disease in the ovary may be limited to the periphery, but later on the ovarian stroma is penetrated. There may be simple superficial tubercles or caseous foci, or ovarian abscesses the size of an egg may be seen. In the latter case, a mixed infection

has probably occurred. At times there is considerable enlargement of the ovary, without softening, the stroma of the ovary being infiltrated with yellow nodes.

Symptoms.—The symptoms of tuberculosis of the ovary are not characteristic, and are usually combined with those of tubal or peritoneal tuberculosis.

Treatment.—The treatment consists in extirpation of the diseased structures. If the tuberculous disease is limited the ovary may be resected.

TUBERCULOSIS OF THE CERVIX

Pathology.—This is a rare form. Beyea was able to collect 69 cases. The cervix may be diseased without any other parts of the genital tract participating in the affection. In Beyea's collection of 69 cases 30 were associated with far-advanced lesions of distant parts of the genital tract. In two primary cervical tuberculosis was discovered at autopsy. Twenty-two were clinical cases, and of these three were associated with lesions in other parts of the genital tract and in distant parts of the body.

Symptoms.—The symptoms are not especially characteristic. As a rule, they consist of leucorrhœa, at times of an offensive odor, and metrorrhagia. Menstruation is generally profuse. The only positive method of determining the presence of a tuberculous lesion is by making a microscopic examination and by injecting fragments of the diseased tissue into guinea-pigs.

The condition has often been mistaken for carcinoma or sarcoma, or has been erroneously classified as ulcer or vegetations. The disease may appear in the form of miliary tubercles scattered over the cervix, or as a papillary mass that resembles carcinoma or a tuberculous ulcer.

Treatment.—The treatment will depend upon the associated lesions and the condition of the patient. If the disease appears to be restricted entirely to a small area of the cervix, a high amputation may be done. If the condition of the tubes is in doubt, it would be justifiable to perform an exploratory abdominal or vaginal section. In advanced cases panhysterectomy is the operation of choice.

TUBERCULOSIS OF THE VAGINA

Pathology.—This is usually secondary, and associated with other tuberculous lesions higher up in the genital tract. It may, however, be the only part affected, one case having been recorded in which a tuberculous ulcer of the vagina was primary.

Symptoms.—The disease usually appears in the form of an ulcer. Tubercles are almost always present, however, on the floor of the ulcer or at the periphery. In the later stages ulceration is multiple, confluent, and displays a tendency to extend into the rectum or the bladder. The disease resembles carcinoma and syphilis, and a differentiation can be made only as the result of microscopic and bacteriologic examination.

Treatment.—In mild cases destructive cauterization may suffice, but in more advanced cases radical excision may be demanded.

TUBERCULOSIS OF THE VULVA

Pathology.—The vulva is the most infrequent site of genital tuberculosis. The rarity of a tuberculous infection of the external genitals has been used as an argument against a direct primary infection, but it is probable that the tubercle bacillus passes over the vulva to find a more fertile soil higher up. Many of the cases described in the literature as lupus, rodent ulcer, and esthiomene, are really tuberculous diseases of the vulva.

Symptoms.—At first there is a dull red or livid discoloration of the skin, which is indurated, and slowly increases in size. After a variable length of time these tumor-like masses soften and break down, forming ulcers. These ulcers vary considerably in size, and are round, oval, or irregular in shape. The edges are infiltrated at first, but later become ragged and undermined. The base is uneven, granular, and covered with a yellow crust. Miliary tubercles are often seen about the borders. The ulcers do not bleed readily; they advance slowly and heal irregularly. After a time, owing to coalescence, extensive destruction of tissue may take place, with the formation of fistula. In other cases there is great proliferation of tissue, with the production of nodules and polypi. If the disease involves the clitoris, this structure may be so much enlarged as to simulate elephantiasis. The inguinal lymph-glands are not involved for some time. Pain is absent, the first symptom observed being, as in Kelly's case, pain on urination after a well-defined ulcer has formed. In many cases the disease is of such slow growth that it remains unnoticed for years.

The syphilitic, chancroidal, and carcinomatous ulcers must be distinguished. The differential diagnosis of syphilis may be made as the result of serum reactions and of anti-luetic treatment. In most cases a microscopic or bacteriologic examination may be necessary.

Treatment.—The only treatment is complete excision. The Röntgen ray may be useful.

BIBLIOGRAPHY

- ARCHAMBAULT, J. L., AND PEARCE, R. M.: "Tuberculose d'un adénomyome de l'utérus." *Rev. d. gynéc. e. d. chir. abd.*, 1907, xi, 3.
- BEYEA, H. D.: "Tuberculosis of the Portio Vaginalis and Cervix Uteri, Its Pathology, Diagnosis and Treatment." *Am. J. Med. Sci.*, 1901, cxxii, 612.
- BORCHGREVINK: "Zur Kritik der Laparotomie bei serösen Bauchfalltuberkulose." *Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, Jena, 1900, vi.
- BULKLEY, K.: "Tuberculosis of the Vulva." *Am. J. Med. Sci.*, 1915, cli, 535. (Very extensive bibliography.)
- HARTZ: "Über die Tuberkulose der weiblichen Genitalorgane." *Monats. f. Geburt. u. Gynäk.*, xvi, 3.
- HUNNER, G. L.: "Tuberculosis of the Urinary System in Women. Report of Thirty-five Cases." *Johns Hopkins Hosp. Bull.*, 1904, 8.
- KÖNIG: "Die peritoneale Tuberkulose und ihre Heilung durch den Bauchschnitt." *Cent. f. Chir.*, Leipzig, 1900, xvii.
- MARTIN, A.: "Zur genitaltuberkulose." *Berl. klin. Woch.*, 1908, xlv, 89.
- MAYO, W. J.: "Surgical Tuberculosis in the Abdominal Cavity with Special Reference to Tuberculous Peritonitis." *J. Am. Med. Asso.*, 1905, xlv; *Ibid.*: "Secondary Tuberculous Peritonitis, Its Cause and Cure." *Trans. Sect. O., G. and A. S., A. M. A.*, 1918, 72.
- MENGE: "Über tuberkulose Pyosalpinx." *Cent. f. Gyn.*, 1894, 24.
- MURPHY, J. B.: "Tuberculosis of the Female Genitalia and Peritoneum." *Am. J. Obst.*, 1903, lxviii, 737; 1904, lxix, 6 and 205.

- NEFF: "Résumé of the Literature on Tuberculosis of the Peritoneum." Trans. South. Surg. and Gyn. Asso., 1901, xiii.
- SCHLIMPERT, H.: "Die Tuberkulose bei der Frau, insbesondere die Bauchfell—und die Genitaltuberkulose, die Tuberkulose des Uropoetischen Systems, die Tuberkulose während Schwangerschaft und Wochenbett, auf Grund von 3514 Sektionen." Arch. f. Gynäk., 1911, xciv, 863.
- SHATTUCK: "On the Prognosis and Treatment of Tuberculosis Peritonitis." Amer. Med., Phila., 1902.
- TAYLOR: "Tuberculosis of the Uterine Appendages." Trans. Sect. O., G. and A. S., M. A., 1915, 88.
- TRUESDALE, P. E.: "Tuberculous Salpingitis." Trans. Sect. O., G. and A. S., A. M. A., 1913, 132.
- WILLIAMS, J. W.: "Tuberculosis of the Female Generative Organs." J. H. Hosp. Reports, 1893, iii, 85.
- WUNDERLICH: "Über die Misserfolge der operativen Behandlung der Bauchfelltuberkulose." Arch. f. Gynäk., 1899, lix.

CHAPTER XXXI

SYPHILIS OF THE GENERATIVE ORGANS

It is unnecessary in this volume to take up a general description of syphilis, or to discuss its nature, course, manifestations, or treatment. Only those facts that especially concern the female will be considered here. The excellent review of Gellhorn and Ehrenfest has been freely quoted from in this chapter.

Syphilis is generally believed to be commoner among men than among women. From the statistics of Hubert, who studied the history of suspected cases and made routine Wassermann tests in all patients who came to his clinic, it appears that syphilis may be more prevalent among women than has heretofore been believed. Whereas in men the primary lesion is usually discovered by the patient or is readily detected by the physician, and whereas in men the primary sore leaves behind unmistakable traces that may persist for prolonged periods, the opposite is true in women.

Several factors contribute toward making the demonstration of the initial lesion in women difficult: First, the female genitalia, being more complex than the male, the sore may develop in a hidden location and thus escape discovery. Secondly, in women the chancre does not present the typical induration with which we are familiar in male patients, unless it is situated on the cutaneous surfaces about the genitalia. When the primary sore is situated upon mucous membranes, there is usually no parchment-like induration of the base; its occurrence there is rare. Thirdly, the primary lesion clears up more rapidly in women than in men. In the former it is so transient that, given marked symptoms of secondary syphilis, the diagnosis is never uncertain even if one has failed to find the original sore.

The general health of the patient is affected more in women than in men. Disturbed menstrual function, menorrhagia or metrorrhagia is frequently observed. Fever and anæmia are common. One of the striking differences is the greater frequency in men of paresis and tabes. This fact may possibly be explained on the ground that the thyroid gland is more active in females than in males, and that the principal secretion of the gland, *i.e.*, iodothyron, as is well known, in common with all iodine compounds, exerts a marked influence on syphilis.

That women may be infected through the medium of the spermatie particles is quite within the range of possibility. Neisser successfully inoculated the skin of monkeys with the parenchyma of the testicles of other infected monkeys. Finger twice succeeded in inoculating monkeys with the sperma of syphilitic men.

"It is permissible to conclude that any part of the genital tract may be infected by the sperm, and that the syphilitic virus may reach even the peritoneal cavity by way of the tubes" (G. and E.). These deductions are

not vitiated by the fact that spirochætæ have not yet been demonstrated in the testes of adult men, or by the acknowledgment of the fact that the virus may have been added to the sperma from a prostatic or urethral nidus of infection.

As the spirochætæ are motile, it is conceivable that they may travel upward into the generative tract against the current caused by the cilia of the uterine and tubal mucosa.

The variations in the local and general manifestations of syphilis give rise to the questions as to whether or not certain organs or tissues are more susceptible than others to luetic infection, and whether the spirochæta pallida shows a predilection for certain organs. Although these questions are unanswerable at present, it would seem possible that the variations are due to differences in the strains of the spirochætæ. The dearth of observations on luetic lesions of the internal genitalia in women, however, suggests that these structures are endowed with a relative immunity.

The primary sore is the result of the introduction of the spirochæta pallida into a minute abrasion on a surface covered with squamous epithelium. The parasite shows a marked predilection for this type of epithelium, so marked, in fact, that chancres are almost never observed on other epithelial surfaces. A chancre exhibits the same structure wherever it is found, although it is subject to modification according to the tissue affected.

"There is in the very early stages a new formation of capillaries, with an infiltration about them of lymphocytes and plasma cells. In the early stage the infiltration is sharply limited; in the later stages it is diffusely scattered throughout the corium. The endothelium of the capillaries is swollen and proliferated, so that the lumen is narrowed or altogether occluded, and the larger vessels, with an external coat, are increased in thickness. Sometimes giant-cells are found. The epidermis suffers secondarily, and presents a varied picture, such as atrophy, hypertrophy, erosion, or ulceration. From the newly formed granulation tissue connective tissue is produced which later scleroses and leads to fibrosis, interference with nutrition, and retrogressive metamorphosis. Spirochætæ can always be demonstrated in the chancre by appropriate staining methods; of these, the new method by Levaditi seems to give the best results. Spirochætæ usually appear in enormous numbers between and within the cells" (G. and E.).

There is little essential difference between the lesions of the three stages of syphilitic infection. "The microscopic picture of secondary syphilitic lesions reproduces that of chancre. The characteristic features are newly formed and dilated blood-vessels exhibiting changes such as those described above, and perivascular infiltrations with lymphocytes and plasma cells. Giant-cells are usually more abundant" (G. and E.).

"Tertiary lesions differ from secondary ones only in the extent of granular infiltration. This is satisfactorily explained by altered tissue reaction, the 'Gewebsumstimmung' of Neisser. Weakened by the long-lasting and all-pervading influence of the syphilitic virus, the tissues offer a lessened resistance to the parasites, although the latter have greatly diminished in number" (G. and E.).

SYPHILIS OF THE VULVA

Chancre of the vulva is so rarely observed that exact information as to its appearance is lacking. For that reason all cases should be described minutely and note made of variations in form. The primary sore in women may be considerably modified by the personal cleanliness of the woman and her habits. The most frequent seat of chancre, it is said, is the labia majora, the fourchette, nymphæ, clitoris, and mons veneris being next in frequency in the order named.

The primary sore is smaller and clears up more rapidly in women than in men. The so-called chancrous erosion is round or oval in shape, with a dusky-red areola and a shining raw surface, the center of which is covered with a gray, false membrane that is slightly moistened with a serosanguineous fluid. On a skin surface, as, *e.g.*, the labia majora, induration develops in about a week and usually presents a parchment-like appearance. On modified skin surfaces near mucous membranes, for example, the labia minora or introitus vaginæ, induration may be absent. The chancre may take the form of an ulcer (chancrous ulceration) with sloping edges, covered with a gray, false membrane, and the seat of a serosanguineous discharge. A third variety of chancre, known as the indurated papule, consists of a hard, elevated, dusky-red tubercle, sharply defined from the surrounding tissues; its surface is dry and frequently encrusted with layers of exfoliated epithelium, Fig. 168.

The appearance of the chancre may be modified as the result of simple inflammation, chancroidal infection, traumatism, and the application of powerful antiseptics.

When infection with chancroid and with syphilis takes place at the same time, the chancroid may heal before the chancre appears. As a rule, the chancroid persists and takes the form of a punched-out, sloughing ulcer, around which an induration gradually develops. When chancroidal virus is engrafted upon a well-developed chancre, a chancroidal ulceration takes place; under such conditions the only indication of the earlier lesion is the induration.

The secondary lesions on the vulva may appear as moist papules (mucous patch) or as broad, flat elevations, the result of hypertrophy of the papillary bodies of the skin; these are known as condylomata lata. Condylomata lata are usually multiple, and frequently affect surfaces that are in apposition, as, for example, the labia. Parts that are subject to the irritating influences of heat and moisture are particularly prone to be affected. Associated with mucous patches there may be an abundant outgrowth of venereal warts. These are due to irritation, and not to any specific virus. The secretions from condylomata lata or mucous patches are prolific sources of infection with the syphilitic virus, Fig. 170.

Gumma of the vulva is rare. It usually develops in the labia majora, which becomes œdematous; it has a tendency to break down and to suppurate. The differential diagnosis is often difficult to make. Ulceration frequently leads to the development of fistulæ, Fig. 169.

SYPHILIS OF THE VAGINA

The primary lesion of syphilis, the chancre, is rarely observed on the vaginal mucosa. When it appears here it resembles closely the primary indurated ulcer seen elsewhere, except that the induration quickly disappears and but little scar tissue remains. The apparent rarity of the vaginal lesion may be due to the fact that it is overlooked in examination, to the absence of symptoms, or to the anatomic peculiarities of the vaginal tract, which usually presents no abrasions in which the spirochætæ may lodge.

The secondary lesions of syphilis in the vagina are rare. Moist papules have been seen in the lower third of the vagina and also in the fornices, where their presence is probably the result of inoculation from a cervical lesion. These maculopapules are described as very small lesions, having a sharp outline, brownish red in color, and covered with a tenacious exudate.

The tertiary lesion of syphilis, the gumma, is seldom found in the vagina. It rarely appears here except as the result of extension of a similar infectious process in a neighboring organ.

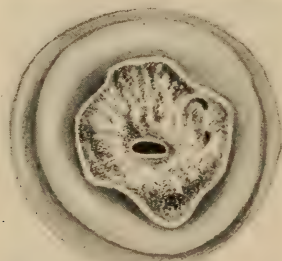


FIG. 458.—Chancre of cervix, engrafted on an erosion. (From Gellhorn and Ehrenfest, after Oppenheim.)

SYPHILIS OF THE CERVIX

Primary chancre of the cervix has very frequently been overlooked. Statistical reports show that of all primary chancres found on the genitalia, not over 1.5 per cent. are on the cervix. It is probable, however, that primary chancre of the cervix occurs in from 4 to 10 per cent. of all cases of genital syphilis. It gives rise to no symptoms. It may affect either labium, but it has been more frequently found on the anterior lip. It may be engrafted upon an erosion due to a laceration, hence it is more frequent in parous women. Pregnancy and the congestion at the menstrual periods seem to favor the entrance of the spirochætæ (Figs. 458 and 459).

A cervical chancre never presents a really characteristic or pathognomonic appearance, on account of its rapid and changing evolution from an uneroded induration to an ulcer that in turn either heals quickly or becomes transformed into a simple erosion.

As enlargement of the inguinal glands does not occur, and because of the difficulty in eliciting induration at its base, a suspicious-looking sore on the cervix can be identified as a primary hard chancre only if the spirochæta pallida is recovered from its surface, and if the cervical lesion

is followed in due time by a typical secondary exanthema. In those instances in which the cervical ulcer appears in conjunction with other typical hard chancres in the vagina or on the external genitalia the presence of a multiplicity of initial lesions must be assumed.

"Secondary syphilis manifests itself upon the cervix in the form of macules, papules, and ulcerations. These forms probably represent three successive stages in the development of a lesion caused by scattered accu-

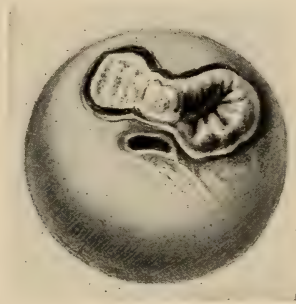


FIG. 459.—Chancre of cervix.
(From Gellhorn and Ehrenfest,
after Fournier.)

mulations of the *spirochæta pallida* in the squamous mucosa of the cervix. The parasite can be recovered readily from the secretion of any of the three forms, and this explains the great infectiousness of secondary lesions. Wassermann is positive in this stage. Macules and papules have no symptomatology of their own, while ulcers may give rise to profuse yellowish discharge. Occasionally a peculiar puffiness of the fornices (*empatement*)



FIG. 460.—Secondary ulcer of posterior lip of cervix. (After Gellhorn and Ehrenfest.)

may be present. The leucoplasmic appearance of macules, the characteristic form of papules, and the typical yellowish color of ulceration render diagnosis comparatively easy. Secondaries in other parts of the body form a valuable aid. Cervical lesions, as a rule, heal quickly and may disappear without leaving any trace. Specific treatment, energetically applied, brings about resolution in a very short time" (G. and E.) (Fig. 460).

"The essential form of tertiary lesion of the cervix is that of a gumma, which, in the majority of instances, undergoes necrosis and ulceration. If

the tissue proliferation predominates, we speak of gumma; if retrogressive changes prevail, we speak of tertiary or gummous ulcer. The process may involve the vagina or extend into the cervical canal, and is frequently associated with similar lesions elsewhere. The consistency is firm, but becomes soft under the influence of tissue necrosis. The most characteristic color is yellow, though various other shades may be observed. Bleeding or profuse mucopurulent discharge is present in most cases, but no pain. These lesions, which may heal spontaneously, with the formation of scar tissue, disappear very quickly when specific treatment is instituted. Local treatment is altogether useless" (G. and E.).

SYPHILIS OF THE UTERUS

"Our knowledge concerning syphilitic lesions of the uterine body is extremely meager. Primary and secondary manifestations have not yet been observed in the uterus, but a few instances of gumma in the uterine wall have been recorded. An isolated observation by Hoffmann proves the possibility of gummatous changes taking place in the endometrium. This infrequency of tertiary lesions is somewhat remarkable in view of the fact that the uterus, more than any other internal organ of the body, is exposed to direct infection. Spirochætæ may reach the uterine cavity by way of the vagina or from lesions of the cervix. Older writers have pointed out that in pregnancy the uterus is exposed to infection from the fœtus, which acquired its syphilitic condition from the father. In the light of modern knowledge, however, in practically every instance the disease is known to be transmitted to the fœtus from the mother, even though syphilis may at the time be latent in the latter. Aside from the question of paternal and maternal infection, it is certain that an actively syphilitic mother invariably infects the fœtus. The logical conclusion to be drawn is that in every pregnant syphilitic woman spirochætæ must be present in the maternal portion of the placenta, *i.e.*, the endometrium. The finding, by Huebschmann, of spirochætæ in the decidua prove this point. Unless, as Whitehouse suggests, syphilitic lesions of the uterus have been overlooked in the past, we are forced to assume that a relative immunity on the part of the uterus exists. It is a very striking fact, says Pusey, in view of their being purely genital structures, that the body of the uterus and its analogue in the male, the prostate, are probably the most rarely involved of any structures in the body affected by tertiary syphilis" (G. and E.).

SYPHILIS OF THE TUBE

"It seems possible that the tubes may be the seat of luetic lesions, but the pathologic and clinical material on record is yet too incomplete to permit of positive assertions. Spirochætæ have never been found in the tubes of syphilitic women" (G. and E.).

SYPHILIS OF THE OVARY

"Various changes in the ovaries (simple enlargement, syphilitic oöphoritis, tertiary sclerosis of ovary, ovarian gumma) have been described as typical expressions of the secondary and tertiary stages of luetic infection,

but in no instance (with the possible exception of Hoffmann's case) has positive proof been furnished that such alterations are actually due to a local luetic process.

"The fact that in some syphilitic patients either an amenorrhœa or, more commonly, a metrorrhagia, disappears after specific medication cannot be accepted as evidence of a syphilitic ovarian lesion. Spirochætæ have as yet not been demonstrated in the ovaries of adults" (G. and E.).

SYPHILIS OF THE CELLULAR TISSUE

"Syphilis of the pelvic cellular tissue appears in the form of a diffuse gummatous infiltration which secondarily involves the pelvic peritoneum" (G. and E.). To the few cases on record a personal observation by Gellhorn and Ehrenfest has been added. In almost all instances a wrong diagnosis of malignancy has been made. In the case of Gellhorn and Ehrenfest the positive outcome of the Wassermann reaction, together with other unmistakable signs of tertiary syphilis about the outer genitalia, aided in establishing the correct diagnosis. "Specific treatment produces amazingly quick improvement of an apparently hopeless condition" (G. and E.).

DIAGNOSIS OF SYPHILIS OF THE GENITAL TRACT IN WOMEN

An absolute diagnosis of the syphilitic nature of an ulcerative lesion of the genitalia can be established only as the result of the demonstration of spirochætæ in the secretion. The large percentage of women afflicted with a latent syphilis and giving positive Wassermann reactions must, to a certain degree, lessen the value of this test as confirmatory of syphilis being the cause of ulcerative lesions about the external genital tract.

Syphilitic lesions of the vulva must be differentiated from herpes genitalis, lupus, esthiomene, condylomata acuminata, chancroid, and gonorrhœal macule.

Syphilitic lesions of the vagina must be differentiated from herpes genitalis, ulcerative processes following the prolonged and continuous wearing of a pessary, ulceration from the use of caustic drugs, aphthous ulcers, and various forms of vaginitis that may show a tendency to produce discrete ulcerative lesions and malignant conditions, such as carcinoma.

Syphilitic lesions of the cervix must be differentiated from simple erosion, chancroid, tuberculous ulcer, gonorrhœal macule, herpes genitalis, aphthous ulcers, carcinoma of the cervix, and perhaps cervical polyp and fibroids.

DIFFERENTIAL DIAGNOSIS OF SYPHILITIC LESIONS OF THE CERVIX

"The prototypes of the three stages of syphilitic infection, the chancre, the macule or papule, and the gumma, offer no particular difficulty to the diagnosis, but ulcerative changes are apt to obscure their characteristic features. It may, then, be helpful to remember certain general characteristics of luetic lesions of the cervix, *viz.*:

"(a) Specific ulcers, as a rule, produce very little secretion; only extensive tertiary ulcers or necrotic gummata cause a pathologic discharge.

"(b) There is no pain, either spontaneous or on touch.

"(c) Luetic lesions are frequently at some distance from the external os, which hardly ever occurs in non-specific ulcerations of the cervix.

"(d) Syphilitic ulcers are characterized by their sharp outline.

"(e) Syphilitic ulcers are usually covered with a film-like deposit which may be wiped off easily and exhibits a characteristic fatty luster.

"(f) Syphilitic ulcers show very little, if any, inflammatory reaction of the surrounding mucosa.

"These common characteristics, however, may be invalidated to a lesser or greater degree by pregnancy, lacerations, coexisting inflammations, or local applications. Thus Mehanos speaks of the misleading fatty luster produced on erosions by the use of caustics.

"In the diagnosis of the primary lesion the demonstration of the spirochætæ pallida is the prime requisite. Next in importance is the characteristic induration of the base, if present. Wassermann is as yet negative. The appearance, in due time, of typical secondaries clinches the diagnosis.

"The diagnosis of secondary ulcerations is based primarily upon the presence of the specific parasite. The positive outcome of the Wassermann reaction is a highly suggestive, but not a conclusive, aid in the diagnosis. The history of infection, coexisting secondary lesions in other parts of the body, and the prompt effect of specific treatment are contributory factors. Occasionally exploratory excision and microscopic examination may be found necessary.

"Tertiary lesions may so quickly develop from secondary ulcerations that differentiation between the two stages may not always be possible. Spirochætæ are not found in the secretion. Wassermann may be negative, especially if the infection has occurred a long time previously. As a rule, other tertiary manifestations are present. The actual findings and the immediate effect of specific treatment will establish the diagnosis. Microscopic examination is frequently a *conditio sine qua non*" (G. and E.).

Chancroid.—Chancroids are, as a rule, multiple. A chancroid of the cervix is usually complicated by a similar lesion on the external genitalia. In contrast to the well-defined contour of a syphilitic ulcer, the edges of the lesion are usually irregular, notched, and undermined, and the base is granular and uneven. The secretion contains the bacillus of Ducrey. The regional lymph-glands are always infected.

Tuberculous Ulcers.—Tuberculous ulcers are regular in shape, their edges being thinned out and deeply undermined. The most important distinction between tuberculous ulcers and syphilitic lesions is found in the marked tenderness of the former.

Gonorrhœal Maculæ.—"Syphilis and gonorrhœa are so frequently combined in the same individual that the differentiation of gonorrhœal macules from macular syphilids is of great practical importance. Gonorrhœal maculæ are less distinctly outlined, vary in size, often forming ill-defined, confluent blotches. Their color is lighter than that of the syphilitic maculæ, appearing as a bright yellowish red. Usually they are lying flat in the level of the mucosa, but they may be elevated, especially when their surface becomes granular, indicating the beginning of a transformation into a condyloma

acuminatum. In this form the gonorrhœal lesion resembles the luetic papule, which, however, is well distinguished by its flat top" (G. and E.).

"**Herpes genitalia** is very rarely observed on the cervix. It manifests itself in the form of single or grouped minute vesicles, with either clear or purulent contents. Each vesicle is surrounded by a bright red zone of inflammation. The vesicles are apt to form polycyclic figures. As a rule, they soon rupture and change into superficial erosions, which preserve a polycyclic arrangement. When infected, they lead to the formation of aphthous ulcers" (G. and E.).

Aphthous Ulcers.—"These have a smooth surface and are covered with a yellowish-white, adherent pseudomembrane. In this form they closely resemble small secondary ulcers or even small primary chancres. Oppenheim emphasizes as a distinguishing feature the firmness with which the covering film adheres, and the distinctness of the surrounding reactive zone in the mucosa."

Myoma.—"Occasionally an intact gumma of the cervix may simulate a fibroid." In one case of Gellhorn and Ehrenfest a nodule in the cervix of a fibromatous uterus was recognized as a gumma only upon microscopic examination.

Carcinoma.—"The correct differentiation between syphilis and carcinoma of the cervix is by far the most important problem to be discussed here." Hysterectomies or amputations of the cervix have been done in cases where later developments demonstrated the presence of syphilis. In some instances the error in diagnosis was not recognized until the patient was on the operating table.

"The similarity of the two affections is indeed striking if the lesion appears in the form of a cauliflower growth; or if a chancre is located within the external os, as described by Mrazek, and causes sloughing of the lowermost part of the cervical canal.

"Neumann believes that infiltration of the parametrium and immobilization of the cervix are common in cancer and rare in luetic ulcers, even in advanced necrotic gummata. It has frequently been stated that cancer bleeds easily, as contrasted with luetic ulcers, and while this may be true in a general way, there are exceptions. Suspicious ulcerations upon the cervix which are separated from the external os by a zone of normal mucosa are more likely to be of a luetic nature.

"The final diagnosis, however, will depend upon the microscope.

"A search for spirochætæ should be made in every doubtful instance. Dark-field examination is superior to other methods, as it enables us to distinguish between the spirochæta pallida, on one hand, and the spirochæta refringens and balanitidis, on the other. The two last-named are commonly found in the vagina and occasionally on necrotic cancers.

"In daily practice the proposition amounts to this: The overwhelming majority of cancers present themselves in an inoperable state. If there be the slightest doubt as to the true nature of the disease, an attempt with anti-luetic treatment should be made. We know that syphilitic lesions respond very promptly to appropriate treatment, and, therefore, not much time would have been wasted even if specific therapy proved to be a failure" (G. and E.).

Prognosis of Syphilitic Conditions of the Genital Tract in Women.—

The prognosis is favorable, the disease is quickly controlled, and the progress toward healing may be gauged not only by inspection and symptomatology, but also by the serum reactions.

Treatment.—A cure may be effected by the use of arsphenamine (salvarsan), neoarsphenamine (neosalvarsan), mercury, and the iodides, either alone or supplementing one another.

BIBLIOGRAPHY

GELLHORN, G., AND EHRENFEST, H.: "Syphilis of the Internal Genital Organs in the Female." *Am. J. Obst.*, 1916, lxxiii, 864. (With complete bibliography.)

CHAPTER XXXII

DISORDERS OF MENSTRUATION

THE physiology of menstruation has previously been considered. Its phenomena depend upon processes involving chiefly the ovaries and the uterus; from this it follows that abnormalities of these organs, whether of a congenital or an acquired nature, may alter the menstrual phenomena in various ways. The menstrual function is influenced also by the glands of internal secretion, the central nervous system, and the general health; it may be modified, therefore, by abnormal functions of the ductless glands, nervous disorders, and constitutional diseases. The menstrual phenomena may vary considerably in different individuals within physiologic limits. Thus, while early puberty usually denotes hyperfunction and late puberty hypofunction of the ovaries, etc., either condition may occur without manifesting any apparent defect in the general health, physical characteristics, or reproductive powers (see Physiology, Chapter IV).

The menstrual flow most commonly recurs every twenty-eight days, but it may vary in periodicity from twenty-one to thirty days.¹ The duration may vary from two days to a full week, and the amount of menstrual blood lost may vary from a scant flow, sufficient to soil but a few napkins a day, to a profuse discharge requiring from eight to ten. Either extreme may occur in a woman who may be free from illness or disturbance of any kind. Of course, those who present variations from the common menstrual type more frequently exhibit pathologic states, local or general, than those in whom menstruation recurs every twenty-eight days and persists for the usual time. Nevertheless, the *menstrual habit*, or custom of the individual, may deviate considerably from the common type, and the subject still be entirely normal.

PRECOCIOUS MENSTRUATION

When puberty begins before the usual period, menstruation is said to be precocious. Those in whom this phenomenon appears show physical and mental indications of sexual maturity beyond their years. In some cases the condition appears to be due to an abnormal development and hyperfunction of the ovaries, and in others sarcoma of the ovary has been found. In some cases a pathologic condition of the pineal gland has been held responsible for the condition. Occasionally the subjects have been hydrocephalic or rachitic. Hemorrhages from the uterus have been known to occur during the first few weeks of life, but this is not regarded as precocious menstruation, but rather an evidence of a stimulation of the endometrium by the hormones in the mother's milk. Forty-four cases of precocious menstruation have been collected by Ploss, the youngest patient being two months old.

¹ Twenty-eight-, thirty- or twenty-one-day type in 83 per cent. of cases. (K. Das.)

DELAYED MENSTRUATION

Menstruation may be regarded as delayed when it does not appear until after the usual age of puberty. This condition is normal in certain individuals, and may have no significance, or it may indicate a general lack of development of the generative organs, hypofunction of the ovaries, or in some cases disease of the pituitary gland or general ill health.

VICARIOUS MENSTRUATION

In some instances hemorrhage from mucous membranes other than the endometrium has been observed at the time of the menstrual flow; this is termed vicarious menstruation. It most frequently takes the form of epistaxis.

AMENORRHOEA

An absence of the menstrual flow during the reproductive period from puberty to the menopause, except during pregnancy or lactation, is abnormal, and is due to pathologic causes, either general or local.

A pseudo-amenorrhœa may exist in which the patient exhibits the general signs of menstruation, without any external evidence of a menstrual flow; this is due to an obstruction in the genital canal. Under such circumstances the menstrual fluid is pent up behind the point of obstruction, constituting a form of gynatresia (see Developmental Anomalies and Malformations, Chapter II).

Etiology.—Amenorrhœa is dependent upon various conditions, and may be classified as anatomic, constitutional and psychic.

Anatomic Defects Producing Amenorrhœa.—These pertain particularly to the ovaries and the uterus. If the ovaries are well developed and the uterus is rudimentary or absent, the ovarian influence is normally present but the uterus is unable to respond in the usual way, and the menstrual flow may either be very scanty or be absent altogether. When these conditions obtain, the patient usually suffers severely from the general phenomena of menstruation, which are known as the *molimina menstrualia*.

When the conditions are reversed, that is to say, when the uterus is well developed but the ovaries have undergone degeneration or are poorly developed, the menstrual impulse is weaker than normal, and may be insufficient to produce a menstrual discharge. Total absence of menstruation, however, with a well-developed uterus, is quite unusual, although not infrequently both the uterus and the ovaries are poorly developed and the menstrual discharge is irregular and scanty.

Amenorrhœa of a more or less marked and persistent type may occur from acquired lesions that involve both ovaries extensively; for example, bilateral cystic or solid tumors of the ovary of a malignant type, or of the type that destroys the ovarian parenchyma. Inflammation of the ovary complicating mumps is at times responsible for an abrogation of the menstrual flow, and certain cases of atrophy of the ovary have been attributed to ovaritis complicating small-pox and scarlet fever. Amenorrhœa may also be due to hyperinvolution of the uterus, the result of prolonged lactation, or

may be traceable to septic postpartal infection with resulting sclerosis. In some cases repeated or excessive curettage of the uterus destroys the endometrium beyond the power of sufficient regeneration, and scanty menstruation or a partial amenorrhœa may result. Amenorrhœa is sometimes observed coincident with, or subsequent to, a general increase in fat at about the age of thirty (see *Premature Menopause*, p. 594). It has been stated that female morphine habitués do not menstruate.

Constitutional Diseases Producing Amenorrhœa.—It is natural that the most prominent general diseases in which scanty or absent menstrual flow is a symptom should be those that affect the blood. The most common of these is chlorosis. According to Virchow, in chlorotic girls not only the blood, but the entire circulatory apparatus, is defective, and this results in faulty development of the genitalia at the time of puberty. Stieda regarded chlorosis as an occasional sign of degeneracy, placing it in the same category with infantile genitalia, infantile pelvis, or abnormalities of the cranial bones. Chlorosis may be attributable to outside influences; that is to say, improper hygiene, etc., although chlorotic individuals usually show other evidences of physical defects. Chlorotic girls do not invariably suffer from amenorrhœa, but may occasionally have a profuse menstrual flow. In some cases the ovaries are unusually large.

After the depressing general influence of certain infectious diseases, such as typhoid fever, amenorrhœa may be present for a time. It may also be observed in tuberculosis, Basedow's disease, diabetes, malignant growths, chronic gastritis, and leucæmia. Amenorrhœa may be one of the earliest symptoms of acromegaly or of Addison's disease.

Psychic Influences Producing Amenorrhœa.—The psychic influences that produce amenorrhœa are hope and fear; that is to say, there may be some delay in the appearance of the menstrual flow in a woman who desires pregnancy or in one who fears it. Such instances are exceptional, however, and the delay does not usually cover more than a week. Cases are on record in which a terrible fright or a fearful catastrophe has produced amenorrhœa, but in such instances it is likely that the cessation of the menstrual flow is only one of the manifestations of mental and physical disaster. A change of climate or altered social relations are frequently responsible for temporary amenorrhœa.

In a few cases the exact cause of amenorrhœa cannot be determined positively. The menstrual flow may cease suddenly in women who otherwise show no derangement in health. Such women may exhibit none of the accepted causes of amenorrhœa, even upon the most careful examination, and after a certain time menstruation may be resumed without any treatment, and with no more apparent reason for its resumption than for its cessation.

Treatment.—It is always desirable to endeavor to find a cause for amenorrhœa before resorting to any definite or prolonged plan of treatment. If the patient has passed the age of puberty without ever having menstruated, or if she has had recurring subjective symptoms of menstruation without a menstrual flow, it may be advisable to make an immediate pelvic examination. As these patients are young, nulliparous women, the examination should invariably be made under anæsthesia. If there are no painful menstrual

molimina, but if evidences of ill health are apparent, this examination need not be insisted upon at once, but the general condition of the patient may be improved in the hope that the function will be established normally.

In chlorotic patients the use of iron, arsenic, and cod-liver oil, regulation of the diet, abundant exercise in the open air, and general improvement of the hygienic conditions should be immediately instituted.

When amenorrhœa is apparently due to psychic influences, much can be accomplished by suggestion, and in case pregnancy is feared, by the absolute assurance that pregnancy does not exist, or by reassuring the patient upon any other point upon which the mind has dwelt. When general measures do not result speedily in the resumption of the menstrual flow, a careful examination should always be made in order to exclude the commonest cause of amenorrhœa—namely, pregnancy. This will usually be true only of patients who have already started to menstruate, and in whom the amenorrhœa might be said to be acquired; pregnancy is not likely to be the cause of the delayed appearance of the function of menstruation.

Pregnancy must always be positively excluded before prescribing any drugs that have, or are believed to have, a direct stimulating effect upon the menstrual flow. At the time of the examination, the cause of the amenorrhœa may be ascertained by finding that the uterus or the ovaries are imperfectly developed. The defect may be more in the nature of an underdevelopment than of an actual deformity. In the first instance, if the uterus is well shaped and of fair length, and if the cervical canal is patulous, toning up the general health may result in marked improvement, especially if a beginning is made during adolescence. In many cases of functional amenorrhœa due to insufficient ovarian development the administration, by the mouth or by hypodermic injection, of extracts of ovarian substance or of the corpus luteum of the cow or sow will stimulate the ovarian secretion or assist it to such a degree that a practically normal flow will ensue. The most satisfactory preparation is said to be the freshly prepared extract of the entire ovary. Either this or the extract of the corpus luteum may be given in doses of from 2 to 5 grains three or four times a day. The extracts of the other glands of internal secretion may sometimes be advantageously combined; thus thyroid extract, $\frac{1}{2}$ to 2 grains three times daily, or the extract of the anterior lobe of the pituitary gland may be used in cases associated with adiposity.

In older women, and in younger ones if general treatment does not suffice, the intrauterine application of the galvanic current may be employed, or an intrauterine stem may be inserted. When the uterus is very small—distinctly below normal in size—and irregular in shape; when the cervical canal is extremely narrow; when the cervix is poorly developed and the ovaries are small or cannot be recognized by bimanual palpation, the outcome of any form of treatment is exceedingly doubtful, and in a majority of cases not much can be achieved.

If the ovaries are sufficiently developed to give a decided menstrual impulse and the uterus is so defective that no menstrual flow is possible, the recurring subjective symptoms may be so painful as to require extirpation of the rudimentary uterus with conservation of the adnexa. When preg-

nancy can be excluded, and after general measures have been instituted, emmenagogues or drugs that are said directly to stimulate the menstrual flow may be prescribed. Cantharides, black oxide of manganese, savin, rue, tansy, pennyroyal, and apiol are believed to stimulate the menstrual flow. Dewees' emmenagogue mixture, which consists of cantharides in combination with iron, aloes, and guaiac, is one of the most effective formulæ.

If pregnancy exists, these drugs will usually have no effect in bringing on the menstrual flow. They may be used as an added stimulant to the menstrual impulse after general and hygienic measures have been adopted, but they should never be pushed beyond the physiologic dose. It is to be understood that what has been said in relation to amenorrhœa applies equally to an absolute non-appearance or abrogation of the menstrual flow, to delay in the monthly recurrence, and to a diminution in the amount of the menstrual discharge.

MENORRHAGIA

Etiology.—Menorrhagia, or an increase in the amount or in the duration of the menstrual flow, may be due to an excessive ovarian impulse, to an enlargement of the area in the uterus that responds to the impulse, or to any local or general condition that produces congestion of the blood-vessels of the uterus and the endometrium.

In some women the menstrual flow is naturally profuse without any gross lesion being present; in these cases the condition is probably an evidence of *hyperfunction* of the ovaries. The flow may recur at periods of from twenty-one to twenty-five days. This may be within the bounds of health, and may have no pathologic significance. Such women are usually large and of the plethoric type. Excess of the ovarian impulse may be found in conjunction with such *local conditions* as prolapse, simple retention cysts, or cystic degeneration of the ovaries. An increase in the surface that sheds the menstrual blood and a congestion of the endometrial vessels are found in such local lesions as hypertrophy of the endometrium, chronic metritis, subinvolution, retroflexio-version or prolapse of the uterus, adenoma or polyp of the endometrium, myoma, sarcoma, and carcinoma of the uterus.

The *general causes* of menorrhagia are frequently overlooked. Among the general causes of pelvic congestion predisposing to menorrhagia may be mentioned cardiac insufficiency, cirrhosis of the liver, and chronic nephritis. Menorrhagia may be a manifestation of hemophilia and scurvy, and be the direct result of alterations in the venous and arterial walls. The frequent occurrence of menorrhagia or metrorrhagia in connection with a positive Wassermann reaction is responsible for the belief that numerous cases of intractable uterine hemorrhage may be attributed to syphilitic changes. Since, however, a large number of cases are found in non-luetic women, and in many no benefit follows anti-syphilitic medication, it is doubtful whether local alterations are as largely responsible for uterine hemorrhage in a syphilitic as is the general effect of the disease upon the system as a whole, reflected in disordered ovarian and uterine function. So, too, the amenorrhœa of secondary syphilis may logically be ascribed to a luetic anæmia or secondary dysfunction of the ovaries.

Menorrhagia is also at times associated with certain acute diseases, such as typhoid fever, cholera, variola, scarlatina, influenza, and acute articular rheumatism. This may be explained either on the ground of a general impairment of the circulatory force, such as is commonly observed in the course of these diseases, or possibly by an exanthematous involvement of the uterine mucosa.

Menorrhagia appears at times to originate in nervous influences affecting the vasomotor system. Thus a fright or any mental shock may result in menorrhagia. It is observed in hysteria and neurasthenia. It is just as reasonable to believe that impulses from the central nervous system may alter the normal menstrual function of the uterus as it is to believe that the pains of labor are affected by psychic impressions.

Noble has tabulated the common causes of menorrhagia according to the age and social condition. While it is our belief that in young virgins disorders of ovarian function or a disarrangement of the coördination in function of the glands of internal secretion are chiefly responsible for menorrhagia, Noble declares that it may be due to a disturbance of the vasomotor system and a lack of vasomotor stability, caused by the active growth that sometimes takes place about the time of puberty. It is quite evident that the vasomotor instability may be secondary to the derangement in the glands of internal secretion.

Menorrhagia in a child-bearing woman is most frequently due to some complication of pregnancy, labor, or the puerperium. Subinvolution and displacement of the uterus, adnexal inflammation, retention within the uterus of decidua or placenta, and severe lacerations of the cervix, with subsequent hypertrophy and chronic congestion, are most frequently responsible for the hemorrhage. In unmarried women, especially in those approaching the age of forty, myomata or an endometrial polyp will frequently be found. Malignant disorders must always be suspected and be carefully excluded before any plan of treatment is adopted.

Treatment.—Except in young unmarried women, a pelvic examination is always imperative before any form of medication is adopted. This rule becomes increasingly important with advancing years. The treatment of menorrhagia, therefore, depends upon the underlying condition. The relaxed, overgrown young woman should be carefully instructed in hygienic regulations, diet, and exercise, and suitable tonics should be prescribed. Hypodermic injections of extracts of the pituitary gland at intervals of several days may be found of service. In such cases when menorrhagia is accompanied by leucorrhœa, hyperplasia of the endometrium may be suspected, and curettement employed as a curative measure. A subinvolted uterus should be depleted by hot douches, glycerine tampons, or curettement; displacements of the uterus should be corrected; chronic constipation should be overcome; cervical lacerations should be repaired or exposed to local depletory measures; myomata, endometrial polyps, and malignant growths should be exposed to operation; enlargement of the ovary, with a persistence of menorrhagia, would usually justify an exploratory abdominal incision.

If no local lesions to account for the symptom are found or if, in addition to the local lesion, or without it, a defect in the circulation is demonstrable, as evidenced by cardiac lesions, contracted kidney, cirrhotic liver,

varicose veins in the lower extremities, hemorrhoids, swelling of the ankles, dyspnoea, and palpation, the use of digitalis and strychnine will do much to diminish the amount of flow.

Ergot, given by mouth or by hypodermic injection, is universally employed to control the hemorrhage; this it does by increasing the contractions of the uterus; it may be combined with hydrastis and its derivatives. Stypticin has been of no particular advantage. It is an expensive remedy, and, according to Boldt, to be effectual it must be given in very large dose—from 1 to 5 grains every two to eight hours. The following prescription of ergotin (Bonjean's), digitalis, and powdered hydrastis is one of the most effectual combinations:

R Ergotin. (Bonjean's)gr. ij
 Pulv. ext. digital.gr. 1/6
 Pulv. hydrast.gr. iij
 q. 3 hrs.

In some cases, as previously noted, hypodermic injections of extract of the pituitary gland may prove effective. Bab reports very favorable results from the use of pituitrin. The intrauterine application of radium is almost invariably effective in checking the recurrence of profuse menorrhagia. It acts by causing obliteration of some of the endometrial capillaries. The Röntgen ray is also effectual. Its favorable influence, it is presumed, is the result of an impairment of follicular development, and hence there is a decrease in the ovarian impulse.

The Röntgen ray must be used guardedly. It affects particularly the follicle-bearing area of the ovary, and undue exposure may result in an entire destruction of the ovarian function (see Radium and Röntgen Ray Therapy, Chapter XL).

Much can be done for patients the subjects of menorrhagia by having them rest during the menstrual period. In serious cases the movements should be restricted absolutely, the patient being kept in bed for from a day or so before the time at which the flow is due until the usual period is past. The application of an ice-bag to the abdomen may assist in reducing the flow. Before the expected time for the flow the bowels should be thoroughly moved by saline laxatives.

METRORRHAGIA

Etiology.—Metrorrhagia, or bleeding between the menstrual epochs, is caused by many of the conditions that produce menorrhagia. As a rule, the underlying cause is further advanced and more pronounced than in the case of menorrhagia. In addition, bleeding between the periods is more often indicative of malignant lesions, such as carcinoma or sarcoma, and also of tubal pregnancy, myomata that have caused pressure atrophy or ulceration of the uterine mucosa, cystic glandular endometritis, and endometrial polyp. Metrorrhagia due to lesions of the myometrium (myopathic metrorrhagia), such as chronic metritis, fibrosis of the uterus, arteriosclerosis of the uterine vessels, etc., is observed in women who are approaching the menopause.

Treatment.—In treating a case of metrorrhagia the first aim of the physician should be to discover its cause. In patients past the age of thirty-five the possibility of carcinoma or sarcoma should be borne in mind, and care must be taken to *exclude* or *confirm* this possibility by the diagnostic methods already described (Malignant Tumors of the Uterus, Chapter XVIII). When the metrorrhagia has been extremely severe and the patient is suddenly weakened from loss of blood, it may be desirable to take immediate steps for relief, such as rest in bed, the application of cold to the lower abdomen, and the exhibition of horse serum. It may also be wise to pack the vagina, or in some cases the uterus, with gauze; it is very rarely necessary to pack the uterus if the vaginal vault is snugly filled with gauze disposed in a circular manner about the cervix, so as to cause compression and occlusion of the cervical canal. Such a vaginal pack, combined with a suprapubic pad and binder, will, in a majority of cases, be effective. A uterine pack should not be carried out without complete aseptic precautions. As a rule, rest in bed, an ice-bag applied to the lower abdomen, and a vaginal pack after a copious douche of hot water will control hemorrhage. The treatment with drugs is similar to that described for menorrhagia.

For the more chronic cases, the exciting cause, whatever it may be, should be removed—that is to say, an endometrial polyp, a thickened endometrium, or a submucous myoma should be treated operatively. Myoma of the uterus, carcinoma, uterine displacement, and pelvic inflammatory disease should be dealt with in the usual way.

Difficulty in the treatment of metrorrhagia is encountered chiefly in those cases in which the bleeding is evidently myopathic (uterine fibrosis, arteriosclerosis, etc.) in origin, or is due to such general lesions as hemophilia, lymphatic obstruction, chronic nephritis, arteriosclerosis, cirrhosis of the liver, etc. In such cases any surgical treatment short of hysterectomy is of little avail.

In radium and the Röntgen ray, but especially in radium (see Radium and Röntgen Ray Therapy, Chapter XL), we have a certain and effectual means of giving relief. When malignant disease of the uterus and adnexa can be excluded, radium is the remedy *par excellence*. It may also be used when the patient's condition is such as to preclude operation, even though surgical intervention is otherwise indicated. After the hemorrhage is controlled, the patient's condition improves and then the operative procedure may be carried out.

When menorrhagia or metrorrhagia is caused by visceral lesions associated with high blood-pressure, caution must be used in the employment of radium or of any other measure to check the bloody flux; for the latter may be of actual benefit to the patient and for the time being at least prevent a rise of the blood-pressure in the arteries to the breaking point. If the patient is not suffering from the loss of blood (anæmia-asthenia, etc.), diagnostic curettage should be done in order to determine that no malignant condition is present in the uterus. When this has been assured, general measures to reduce the blood-pressure should be instituted, but neither local nor operative treatment to check the flow should be undertaken.

DYSMENORRHOEA

A woman is said to be suffering from dysmenorrhœa when the subjective manifestations of the menstrual period are so exaggerated that she complains of marked pain or discomfort in the lower abdomen and pelvis, thighs, or sacral region. Severe headache, occurring regularly at the menstrual periods, whether or not accompanied by pain elsewhere, may be considered a form of dysmenorrhœa, although in many instances its relation to the menstrual process is not entirely clear.²

Severe dysmenorrhœa is often accompanied by such extragenital symptoms as eye-strain and contraction of the field of vision, cutaneous eruptions, such as acne and eczema, and by neuralgic conditions, for example, toothache and joint pains.

Etiology.—Dysmenorrhœa may be the result of a large number of different causes. It is not a disease, but a symptom, the reason for which, however, it is sometimes extremely difficult to find. The treatment of dysmenorrhœa should never be continued indefinitely without the fullest sort of an investigation being made to determine whether or not it is dependent upon demonstrable organic alteration. If this is not done, symptomatic treatment may be carried on for a considerable length of time without giving relief, when some simple operative plan might effect an immediate cure.

The cases in which dysmenorrhœa is most likely to be looked upon as a disease and not as a symptom are those in which no organic lesion can be found to explain it, or the anatomic variation from the normal may be so slight as to make it doubtful whether it is really responsible for the trouble. Dysmenorrhœa of this type may be ascribed to a certain degree of hypoplasia of the uterus or adnexa, of which little gross evidence exists. Such a condition would be difficult to demonstrate even microscopically, as it probably affects mostly the blood and nerve supply.

For convenience of description and study, dysmenorrhœa may be divided into two classes: (1) That due to congenital defects, and (2) that due to acquired lesions. It is to be understood that developmental defects of the genital apparatus include not only those that are demonstrable, but also those that are of such degree as almost to deserve the name of hypothetic. To the latter we have given the term "vascular and nervous" for want of a better one; they are often associated with general hypoplasia—the subjects are physically subnormal and have an unstable nervous organization.

Dysmenorrhœa Due to Development Defects.—These defects usually consist of abnormalities in the size and the shape of the uterus. They may be very well marked or only slight. The uterus may be infantile, and the body of the organ may be acutely anteflexed on the cervix, which is long, narrow, and tapering, or short and knob-like. The cervical canal itself may

² The belief that physiologic and pathologic states of the female generative organs often produce headache is widespread. Text-books list dysmenorrhœa, "uterine disease," disease of the ovaries and even of the bladder, as causes of headache, and yet no real justification for these beliefs has been attempted. Headache is, of course, exceedingly common during menstruation, but so it is in eclampsia, and yet no one to-day connects the eclamptic headache in any direct way with the condition of the uterus. Toxemia of the menstrual period is a much more plausible, though not a demonstrable, hypothesis.—Cabot, R. C.: *Differential Diagnosis*. Saunders, Phila., 1911.

be very narrow and stenotic, or it may be kinked and obstructed by a sharp antelexion. There may be double formation (uterus didelphys or uterus bicornis), with equal or unequal development of the two halves; this condition may be associated with stenosis, with retention of the menstrual fluid behind the point of obstruction (see Gynatresia, page 23).

In addition to such defects, which are easily recognized, many cases of dysmenorrhœa are seen in which no apparent cause can be demonstrated, the pain being explainable only on the ground of a deficiency in the muscular tissue of the uterus or an abnormal nerve or blood supply to the uterus and ovaries; or the individual may be so constituted that what would cause but slight discomfort in the average person would in her produce severe pain (psychoneurosis).

As moderate degrees of antelexion and stenosis may be combined with developmental defects in the vascular or nervous apparatus, it is often quite impossible in an individual case to say that the pain is or is not due entirely to an obstruction of the cervical canal. If the surgeon does not bear the possibility of this combination of causes in mind, he will often be disappointed in the results of an operation to overcome the stenosis or antelexion.³

The influence of cervical stenosis as contrasted with the influence of the developmental deficiency of the vascular and nervous supply may be differentiated, or an attempt may be made to differentiate between the conditions by observing with particular care the time of appearance of the pain and other peculiarities. Thus, when dysmenorrhœa is due to obstruction of the cervical canal, it usually precedes the appearance of the menstrual flow, and begins to subside as soon as the flow is well established. It may recur at intervals even after the flow appears, but there is a tendency for the paroxysms of pain to become less frequent and less severe. The pain is situated in the lower abdomen—suprapubic; it may be felt more on one side of the midline than on the other; it may radiate to the sacral region or down the thighs. The paroxysms of pain mark a succession of uterine contractions that recur until additional menstrual fluid is expelled, when the pain subsides for a time (see Pathologic Antelexion, page 239).

The type of dysmenorrhœa due to nervous or vascular defects often begins several days before the flow sets in, and may persist throughout the period. Preceding the period there may be severe, dull, aching pain in the lower abdomen, back, and limbs, with an exaggeration of the usual nervous phenomena of menstruation. During the flow the pain is most severe in the ovarian and sacral regions; it is described as boring or burning in nature, or as "great soreness," etc. The patient is often poorly developed physically and of a nervous temperament.

Dysmenorrhœa due to developmental defects dates from the very onset of the menstrual function—the age of puberty.

As the obstructive form of pain may be combined with the nervous or

³ Kelly and other observers have expressed a doubt as to whether stenosis of the cervix alone produces painful menstruation, basing their doubt upon the following reasons: First, because it is said that the pain begins when there is no blood in the uterus; secondly, the amount of blood is too small; thirdly, menstrual blood will pass through an exceedingly narrow lumen; and fourthly, only one-half of the cases of stenosis have dysmenorrhœa.

vascular and nervous type, it may readily be seen that the surgeon must always be guarded in making a prognosis of an operation to overcome stenosis or obstruction of the cervical canal.

Dysmenorrhœa Due to Acquired Lesions.—Dysmenorrhœa may be a symptom of almost any pelvic disease; for example, uterine displacement, cervical polyp, chronic endometritis or hyperplasia of the endometrium, pelvic inflammatory disease, and ovarian tumors. Displacement downward and backward of the small anteфлекed uterus is regarded by Graves as a more or less frequent source of dysmenorrhœa. In all these conditions the pain is but a symptom, and its cure lies in the correction of the lesion producing it. Certain changes in the ovaries that are difficult to recognize upon pelvic examination are believed in some cases to be responsible for dysmenorrhœa: these are probably predisposed to by repeated pelvic congestion, as from prolonged sitting, chronic constipation, and insufficient exercise. The extent of the influence of masturbation and ungratified sexual inclinations on their production is not known. The anatomic alterations consist of a thickening of the tunica albuginea, increased density of the ovarian stroma, and the immature development of numerous follicles, so that the ovary undergoes a form of cystic degeneration (microcystic). The anatomic changes in the ovary may be responsible for the dysmenorrhœa, and are also an evidence of faulty ovarian function, as well as of disturbance in the vascular and nervous supply of the entire pelvis.

Acquired dysmenorrhœa assumes the aspect of a disease *per se* in those cases in which it cannot be explained satisfactorily by the gross local conditions found on pelvic examination. Here we again approach the vascular and nervous type above discussed under the developmental defects. Such menstrual pain may develop after puberty, and be due entirely to the influence upon the general health of faulty hygiene, intercurrent diseases, excessive tax upon the nervous system, and mental strain. Mental depression, neurasthenia, and general hyperæsthesia are predisposing factors in the production of the painful subjective phenomena associated with menstruation (psychoneurosis). The same processes, occurring in vigorous, healthy individuals, would not be regarded or appreciated as constituting actual pain. On the contrary, dysmenorrhœa may, in the course of time, have a marked effect upon the nervous equilibrium of the individual, even though she were previously essentially normal in this respect, and lead to nervous irritability, exhaustion, and depression.

In the acquired forms of dysmenorrhœa the history may show that normal and uncomplicated menstruation occurred for a longer or shorter period after puberty and that the dysmenorrhœa developed *pari passu* with the acquired lesion. It need not be explained, of course, that all acquired lesions may be engrafted upon a developmental defect existing at puberty.

Treatment.—It is to be understood that the treatment here laid down does not necessarily apply to cases in which dysmenorrhœa is but a symptom of a gross disease of the pelvis, nor to those cases in which it is quite certain that marked anteфlexion and stenosis of the cervix are responsible for the condition. Under these circumstances the treatment is self-evident, and is described elsewhere. Only those cases will be dealt with here in which there

is no gross disease to account for the suffering, and those in which some doubt exists as to whether a stenosis of the cervix or an acute ante flexion is or is not responsible for the pain.

Every patient should at the outset be examined most carefully with regard to her general condition, physical and mental, and suitable measures prescribed to place her in good condition. The anæmic, constipated, overworked girl of sedentary occupation should be instructed in regard to the care of the bowels, the taking of regular exercise in the open air, the selection of food, and the habit in dress (see *Hygiene of Adolescence*, p. 609). An effort should be made to remove any source of mental anxiety and worry, or so to encourage and fortify the patient by suggestion that she will be able to overcome any mental distress. These conditions may be difficult to correct, but an earnest effort should, nevertheless, be made to do so.

At the time of the menstrual period the bowels should be moved freely with the aid of salines. Hot sitz-baths, hot rectal injections, or the application of an ice-bag to the sacrum may give relief from the pain. The remedies that have been recommended and prescribed are almost numberless, and in many cases useless. Of the simpler drugs most likely to prove effectual may be mentioned aspirin and the bromides. In many cases of the congestive type, as well as in some of the obstructive form, considerable relief has been gained from the administration of ovarian substance or extract of the corpus luteum of the cow and sow. Failure in the use of these remedies may be due to insufficient dose.

In some cases of the obstructive type with paroxysms of uterine colic the administration of atropin sulphate in doses of 1/100 grain three to six times a day for several days preceding the onset of the period has been followed by relief. Atropin has been advantageously combined with aspirin.

The most recent addition to the therapeutics of dysmenorrhœa is benzyl benzoate. It is said to have a selective anti-spasmodic effect on smooth muscle-fibers. It is recommended chiefly in that form of dysmenorrhœa, designated as vagotonic by Block, which is marked by spasm and increased irritability of the uterine muscle. Any form, however, may be benefited. The drug is exhibited in a 20 per cent. emulsion, one to two drams at a dose. There is also a hypodermic preparation on the market.

The nasal treatment of dysmenorrhœa, first advised by Fliess, has been favorably reported on by a number of reliable observers. Fliess discovered that if the areas on the anterior half of the lower turbinate bones and the tuberculum of the septum, which may be found to be congested during the menses, were cocainized, menstrual pain was relieved. In the beginning of the treatment cocaine may be used as a test to indicate whether success is likely to follow. To secure a permanent effect, cauterization with trichloroacetic acid or the cautery, preferably the former, may be carried out between the periods—about four times during the interval. It may be desirable to repeat the treatment at intervals over a period of two months. To this end the patient should be placed in the hands of a skilled rhinologist. (For the technic of this treatment the reader is referred to the paper of Brettauer; see bibliography at end of chapter.)

Often none of these measures will be effectual, and relief from medicines can

be obtained only by using a derivative of opium in combination with a coal-tar preparation. A favorite prescription is a capsule containing codein ($\frac{1}{3}$ grain) and compound acetanilide powder (5 grains). These should be used very sparingly, however, and the patient should be made aware of what she is taking. The minimum amount—no more—that will control or render the pain bearable should be taken. One or two capsules at a period will tide the patient over the worst of her suffering. If more are required, the case should be treated surgically.

Stimulation of the uterine muscles and development of the canal of the cervix by the application of the intrauterine galvanic electrode have brought a certain measure of relief in some cases. This form of treatment is generally objectionable, however; when it succeeds in dysmenorrhœa of the obstructive type, the dilatation of the canal incident to the treatment is possibly largely responsible for the results. When other measures, drugs, and operation fail, galvanism may be tried. In at least one case this form of treatment successfully relieved violent menstrual pain in the sacral region and thighs after dilatation of the cervix, cocaineization of the nasal septum, and numerous drugs had been used without result.

When a sufficient time has been allowed to elapse for improvement in the general conditions to exert an influence on the menstrual periods, and if no relief has been obtained as the result of the methods here described, operative measures must be considered. The simplest and most effectual consists of dilatation of the cervical canal under anæsthesia, followed by the introduction of an intrauterine stem, that of Norris being preferred. When the pain is due solely to obstruction of the cervical canal, such a procedure will favorably influence the discomfort, and may result in a complete and permanent cure; even when the pain is due, at least in part, to faulty vascular or nervous development, improvement may follow the adoption of this plan. (For the technic of this procedure see page 243.) The effect of the drain is not only to overcome the stenosis or kinking of the cervical canal, but also to increase the nutrition of the part and improve its vascular supply.

When this plan is not followed by success, the surgeon will do well to hesitate before suggesting further operative interference. At times the suffering is so great that other measures must be considered. Thus, if the cervix is very acutely anteflexed and the anterior vaginal wall is short, Reynolds' plan of separating the cervix from its anterior vaginal attachment by a transverse incision, followed by longitudinal suture, may be adopted, or Pozzi's or Dudley's operation may be used, either alone or combined with the introduction of a Norris drain.

In very severe cases, in which there is probable or undoubted ovarian enlargement, an exploratory laparotomy for the purpose of ascertaining the condition of the ovaries is justifiable. Unless the ovary is positively and unmistakably diseased, its removal usually has but little influence on the condition. In some cases, where the ovarian capsule is thickened and the ovary is filled with small, unruptured Graafian follicles, an attempt has often been made to relieve the pain by resecting a portion of the ovary or removing it entirely. This plan has frequently been followed by failure, and occasionally

the condition of the ovaries and of the patient has been rendered worse than before.

If, therefore, the ovary is not distinctly diseased, it is best to allow it to remain, suspending it if prolapsed, or freeing it, if adherent. The veins of the broad ligaments should be carefully examined, and if they are varicose, a portion of them should be excised. In a majority of instances it is advisable to avoid any operative treatment except that directed to the cervix. In many cases nothing short of pregnancy and labor will cure the patient, so that the most the physician can do after the simpler operative plans have failed is to tide her along as best he can. It is exceptional to find a case in which general measures or operation on the cervix do not at least greatly relieve, if not cure, the patient. In the exceptional cases the best that can be done is to prescribe suitable medicinal treatment, and to observe the pelvis closely, so that any diseases may be detected early in their development. It has been said that in very rare instances supravaginal hysterectomy with bilateral salpingo-oophorectomy is justifiable in order to cure an otherwise hopeless case.

INTERVAL DYSMENORRHOEA

Attacks of pain resembling dysmenorrhœa may recur periodically (half-way or thereabouts) between the menstrual periods (interval pain). This has been said to be due to aberrant ovulation occurring in chronically diseased ovaries. In many of these cases, however, ovarian disease cannot be demonstrated.⁴

MEMBRANOUS DYSMENORRHOEA

A severe, cramp-like, paroxysmal pain accompanying the menstrual flow is sometimes associated with a discharge from the uterus of portions of the uterine mucosa; occasionally a considerable portion of the endometrium will be discharged in one piece. Under such circumstances the discharged tissue with the attached blood-clot presents the appearance of a more or less perfect cast of the

⁴Heaney, in a paper upon Periodic Intermenstrual Pain, gives a review of 66 cases, 3 of which he observed personally. The frequency of the condition is given by Rosner as 12 in 2350. The majority of the cases occurred between the ages of twenty-five and thirty-five. The frequency in patients above and below these ages was about the same. The largest number of cases seemed to correspond to the period of greatest sexual activity.

There was a high percentage of sterility—about 33 per cent. The menstrual type in the cases varied. Almost all the patients were regular as regards their periods, but there were quite a number in whom the flow was scanty. In a few intermenstrual pain began at puberty. In most of the others it occurred quite a number of years afterward. The pain is somewhat characteristic. It starts at any time midway between the menstrual periods, on or about the fourteenth day after the onset of the last menstruation. The pain is distinctly periodic, and occurs every month with as much regularity as menstruation itself. When once established, it rarely fails to appear unless amenorrhœa occurs, when as a rule, it ceases.

The pain usually begins on one side of the lower abdomen or groin, the left more often than the right; it is cramp-like, spasmodic, and intermittent, with periods of relative or complete recession. Radiation to the leg, to the opposite side, or occasionally to the groin is noted. The pains become more frequent and of longer duration, and generally become diffused over the entire lower abdomen, with tenderness on pressure. Rarely the pain is dull and aching; more often it is sharp, tearing and lancinating in character. In the milder cases the suffering is relieved by the application of heat; in severe cases opiates are necessary. The duration is usually two or three days; it may, however, continue until near the next menstrual period. The time of greatest relief is usually just after

uterine cavity. The diagnosis can be arrived at only by making a microscopic examination of the discharged tissue, since there is difficulty in distinguishing macroscopically between endometrial tissue and clotted blood.

Etiology.—The cause of membranous dysmenorrhœa is not known absolutely. Three factors have been held responsible: First, an interstitial endometritis that interferes with the separation and expulsion of the endometrium in fragments (Winter ascribes the pain to the exudation previous to the detachment of the membrane, and not alone to uterine contraction); secondly, a diminution in the tryptic ferment of the uterine mucosa, which normally softens and digests the mucosa preparatory to its extrusion; and thirdly, some as yet unexplained reaction in the endometrium resulting from a reduction in the ovarian hormones.

Some authorities have denied the possibility of an inflammatory disease of the endometrium serving as the cause of membranous dysmenorrhœa, on the ground that the condition often occurs in virgins and in sterile but otherwise healthy women. Others believe that the inflammatory lesion may have dated from infantile gonorrhœa; or that the endometrial change may be the late result of an acute exanthematous disease in childhood. In these cases the menses are often irregular and sterility is the rule. When pregnancy does occur, it is frequently interrupted.

Treatment.—The condition is difficult to overcome; before resorting to operative measures, the various anti-dysmenorrhœic drugs and ovarian substance should be used. The operative treatment consists in dilating the cervix, curettage, and the introduction of an intrauterine stem. In the most severe cases supravaginal hysterectomy with conservation of the adnexa may ultimately be required.

THE MENOPAUSE

The menopause, or the cessation of the menstrual function, marks the end of the reproductive period of a woman's life. As a rule, the menopause occurs at about the age of forty-five, although it may take place at any time between the fortieth and the fiftieth year. It is frequently the case that

menstruation. Purefoy mentions a case in which the patient had intermenstrual pain in the breasts and none in the abdomen. At times the pain is accompanied by a colorless vaginal discharge.

All cases show pathologic alterations, and the author states that it has been difficult to separate the essential from the complicating lesions. Out of 29 cases which the author collected from the literature, laparotomy is recorded as having been performed in 6; in 5 a fibroid uterus was found, and in all the ovaries were either sclerotic or had undergone cystic degeneration. Rosner, in a series of 12 private patients, found only one with normal pelvic organs; the others showed increased sensitiveness or enlargement of the ovary or ovarian prolapse. There was also a general increase in the uterine dimensions which he called "diffuse pathologic hypertrophy."

Various theories have been adduced to explain intermenstrual pain. Drennan believes the pain to be due to the escape of a non-fertilized ovum, associated with expulsive efforts on the part of the uterus. Addinsell ascribed the symptom to *hydrops tubæ profluens*, the pain being thought to occur when the tube expels its contents. Küstner asserts that the disturbance is the result of ovulation which is asynchronous with menstruation, and that the pain is due to the resistance met by the follicle in its effort to burst and release the ovum.

After discussing these theories and others that have been proposed, as well as the relation between menstruation and ovulation, the author states that he believes that periodic intermenstrual pain is an insufficient or abortive attempt at menstruation, the pain being a form of dysmenorrhœa, the whole picture depending upon degenerative and sclerotic conditions in the ovaries and uterus.

when menstruation begins early in life, it ends late, and that when it begins late, it ends early.

Symptoms.—The menstrual flow, as a rule, does not cease at once, but the menstrual periods become gradually less frequent and the flow less profuse, finally disappearing altogether. During the time the menstrual function is disappearing certain subjective symptoms appear that may be regarded as evidence of the alterations in metabolism that necessarily take place upon the abrogation of such intricate processes as ovulation and menstruation. The woman experiences general or local sensations of heat or cold, attacks of profuse perspiration, nervousness, and irritability, headache, and depression of spirits. In the healthy, robust woman, such symptoms may be disregarded; but in the neurotic and weak they may be bitterly complained of and associated with mental irregularities.

Treatment.—For healthy women no especial management is necessary during the time of the menopause. When the nervous manifestations are marked, and when they cause considerable distress, it is advisable to put the patient in as good general condition as possible, to tone up the nervous system, and to employ ovarian or corpus luteum extract and nerve sedatives, such as sumbul, viburnum, and the bromides. The rest cure is sometimes of benefit.

The most important part of the management of the menopause is to be constantly on guard lest early symptoms of beginning malignant disorders are overlooked. For this reason any woman coming under the care of a physician at this period of her life should be questioned regarding leucorrhœal discharge, irregular bleeding, and local symptoms of any sort referable to the pelvic organs. Unless the patient is absolutely free from abnormal symptoms of any kind, a thorough examination should be made. It need not be stated that the indication for this examination is all the more urgent when the amount of blood lost at a period increases or when bleeding occurs between the periods or long after the menopause is believed to have been past.

There is a very deeply rooted impression that any menstrual irregularity at the time of the menopause is more or less peculiar to that time of life and entirely within the bounds of health. This is a fallacy. In normal women the menstrual epochs become more and more infrequent, and with each period the flow grows less. Although a deviation from the normal does not, by any means, always indicate malignancy, it occasionally does so, and has often been disregarded until the patient's condition is hopeless. For that reason patients at the menopause should be questioned regarding their menstruation, and if there is any irregularity or variation from the normal, a thorough examination should be undertaken immediately, so as to exclude diseases of a malignant type. Women should be acquainted of these facts by their family physician, so that they will voluntarily seek his advice immediately upon the appearance of pelvic symptoms.

PREMATURE MENOPAUSE

Etiology.—The menopause may occur considerably earlier in life than normal. Not infrequently it takes place during the early thirties, and is often accompanied or preceded by a considerable increase of adi-

pose tissue throughout the body. Such women have usually had a late puberty, are short in stature, suffer from amenorrhœa, dysmenorrhœa, and sterility, and give the general impression of incomplete sexual development. There may be some pernicious influence of the thyroid gland to explain the cessation of ovarian activity. Amenorrhœa and obesity are observed in hypothyroidism. The pituitary gland may also be concerned in the premature menopause—hypofunction of the gland has been found clinically to be associated with irregular menses, amenorrhœa, and sterility. Similarly the adrenal glands, when defective, may be associated with diminished function and even with atrophy of the genitalia. In a few cases acquired changes in the ovary (oöphoritis associated with acute febrile diseases, lactation, atrophy, etc.) are probably the important factors.

Treatment.—The treatment is very unsatisfactory and often of no avail. An attempt may be made to secure results by treating the adiposity, the reduction of which, in some cases at least, may have a beneficent effect on the menstrual periods. In addition, thyroid, pituitary, adrenal, and ovarian extracts, tonics, and various emmenagogues may be prescribed. Finally, the cervix may be dilated and a Norris stem introduced, in the hope that the nutrition of the uterus may be improved and a return of the menstrual flow thus secured.

ARTIFICIAL MENOPAUSE

Etiology.—The artificial menopause is the abrupt cessation of the menstrual function occasioned by the removal of both ovaries during the course of a pelvic operation. In women past thirty this artificial menopause may be accompanied by no more serious symptoms than those that attend the normal menopause. In highly neurotic women of this age, or in women under twenty, however, the condition may be accompanied with the most exaggerated nervous symptoms and complaints. In mentally weak individuals a form of mental perversion may develop, the patient continually indulging in morbid introspection, and in severe cases becoming mentally deranged.

In adolescence ovariectomy is a serious matter, sometimes changing the entire life of the individual, rendering her prematurely old, and being conducive to general ill health and many forms of nervous disorders. There may be a tendency to obesity and an overgrowth of hair upon the face. Such women are said to show a tendency to approach the male type and to lose sexual feeling. Castration before marriage interferes with the development of a *libido sexualis*. In women who have been married for some time and in whom the *libido sexualis* is matured, there is usually no diminution of sexual feeling. Indeed, the removal of diseased and painful ovaries may make coitus more agreeable or at least less objectionable. To every woman the knowledge that she is incapacitated for motherhood brings a certain measure of regret, determined by the intensity of her feelings. To avoid such distressing sequellæ removal of both ovaries is to be most scrupulously avoided up to the age of thirty-five.

Some gynecologists, notably Graves, believe that the artificial menopause in itself causes no more marked disturbances than does the normal

change of life. He divides the nervous symptoms of the menopause into two distinct groups—the vasomotor and the neurotic. The first are due to the loss of the ovarian secretion, and last, on the average, from two to three months; they are almost invariably relieved by the exhibition of ovarian extract. The second group, the psychoneuroses, he believes are by no means “definitely consequent” on the loss of the ovaries. They may be brought about by carelessly performed operations that leave the patient with distressing post-operative sequelæ, such as adhesions, painful stumps, prolapse of the cervix, incisional hernia, etc., or by mental suggestion—a sense of degradation induced by the criticism of an unfeeling husband or the remarks of unwise friends.

Treatment.—The treatment of the artificial menopause is unnecessary, of course, in women in whom the symptoms are not distressing. In others the disagreeable nervous symptoms may be relieved by the administration of the desiccated entire ovary or the desiccated corpus luteum, attempting to supply in this way what is believed to be the internal secreting structure of the ovary. The most satisfactory preparation is the freshly desiccated entire ovary. This may be given in tablet form, 2 to 5 grains three times daily. The extract of the corpus luteum is preferred by some, and in many cases has undoubtedly given excellent results; the dose is 5 grains three times daily. A fluid preparation of the extract of corpus luteum for hypodermic use is on the market. As with all organic extracts, the initial dose should be small and gradually increased, if necessary. Nerve sedatives, such as the bromides, *viburnum-opulum*, *sumbul*, and *asafetida*, at times do good. Abundant exercise or an active out-of-door life is of the greatest benefit. An effort should be made to minimize the importance of the symptoms, and the patient should be encouraged to take a matter-of-fact view of her condition. Many foolish notions and depressing beliefs relative to castration may be in the patient's mind.

BIBLIOGRAPHY

- BAB, H.: “Organotherapeutische Erfahrungen und Anwendung von Aphrodisiaka in der Gynäkologie.” *Frauenarzt*, 1913, xxviii, 543.
- BRETTAUER, J.: “Further Report of Cases of Dysmenorrhœa Relieved by Nasal Treatment.” *Trans. Am. Gyn. Soc.*, 1913, xxxviii, 80.
- Busey, S.C.: “Vulvar or Vaginal Hemorrhage in the Newly-born.” *Trans. Obst. and Gyn. Soc., Wash., D. C.*, 1889-90, iii, 25.
- CABOT, R. C.: *Differential Diagnosis*. Saunders, Phila., 1911.
- COE, H. C.: “Menstrual Disorders of Obscure Origin.” *Am. Jour. Obst.*, 1911, lxiii, 790.
- DICKINSON, R. L.: “Conservation of Sound Ovaries and Tubes in Hysterectomies Near the Menopause, Except in Malignant Disease.” *Trans. Am. Gyn. Soc.*, 1911, xxxvi, 324.
- EHRENFEST, H.: “The Influence of the Central Nervous System in the Causation of Uterine Hemorrhage.” *Am. Jour. Obst.*, 1908, lvii, 161.
- FLIESS: “Die Nasale Reflexneurose.” *Verhandl. Cong. f. innere Med., Zwölfter Congress.* S. 384, Wiesbaden; *Ibid.*: “Magenschmerz u. Dysmenorrhœa in neuen Zusammenhang.” *Wien. klin. Rundschau*, 1895, ix, 1.
- FRANKEL, L.: “Normale u. Pathologische sexual Physiologie des Wiebes.” *Handbuch der gesamten Frauenheilkunde*, W. Liepmann, ii, Vogel, Leipzig, 1914.
- FRANK, R. T.: “The Clinical Manifestations of Disease of the Glands of Internal Secretion in Gynecological and Obstetrical Patients.” *Surg., Gynec. and Obst.*, 1914, xix, 618.
- FRANKL, O.: “Pathologische Anatomie u. Histologie der weiblichen Genitalorgane.” *Handbuch der gesamten Frauenheilkunde*, W. Liepmann, iii, Vogel, Leipzig, 1914.
- FRANQUE, V.: “Beitrage zur pathologische Anatomie der Endometritis Exfoliativa.” *Ztschr. f. Geburtsch u. Gynäk.*, 1891, xxii, 1.

- GRAVES, W. P.: "Influence of the Ovary as an Organ of Internal Secretion." *Am. Jour. Obst.*, 1913, lxxvii, 649; *Ibid.*: "Ovarian Organotherapy." *Trans. O., G. and A. S., A. M. A.*, 1917, 147.
- HEANEY, N. S.: "Periodic Intermenstrual Pain." *Surg., Gyn. and Obst.*, 1910, xi, 361.
- KELLY, H. A.: "Dysmenorrhœa—Its Causes and Treatment." *Am. Jour. Obst.*, 1894, xxix, 502.
- LITZENBERG, J. C.: "The Use of Benzyl Benzoate in Dysmenorrhœa." *Jour. Am. Med. Asso.*, 1919, lxxiii, 601.
- MCRÆ, F. W.: "Conservative Surgery of the Pelvic Organs and the Lower Abdominal Wall." *Jour. Am. Med. Asso.*, 1910, lvii, 2215.
- MONTGOMERY, E. E.: "Premature Menopause." *Med. News*, 1894, lxxv, 461.
- NOBLE, C. P.: "Profuse Menstruation." *Ann. f. Gyn. et Pediat.*, 1894, vii, 334.
- NORRIS, C. C.: "The Menopause." *Am. Jour. Obst.*, 1910, lxi, 203.
- NOVAK, E.: "Some Neglected Principles in the Causation of Menstrual Disorders." *Am. Jour. Obst.*, 1910, lxii, 601; *Ibid.*: "The Atropin Treatment of Dysmenorrhœa." *Jour. Am. Med. Asso.*, 1915, lxiv, 120; *Ibid.*: "The Corpus Luteum." *Trans. O., G. and A. S., A. M. A.*, 1916, 44; *Ibid.*: "The Pathologic Physiology of Uterine Bleeding." *Trans. Sect. O., G. and A. S., A. M. A.*, 1914, 220.
- PLOSS: *Das Weib in der Natur u. Völkerkunde*. Leipzig, 1905.
- SANES, K. I.: "Is Membranous Dysmenorrhœa Caused by Endometritis?" *Trans. Sect. O., G. and A. S., A. M. A.*, 1913, 304.
- STEPHENSON: "On the Relation Between Chlorosis and Menstruation, an Analysis of 232 Cases." *Trans. Obst. Soc., London*, 1889, xxxi, 104.
- STIEDA: "Chlorose u. Entwicklungstörungen." *Ztschr. f. Geburtsch. u. Gynäk.*, xxxii, 60 and 97.
- TAIT, L.: *Diseases of Women and Abdominal Surgery*. Phila., 1889.
- THORN: "Beitrage z. Lehre von der Atrophia Uteri." *Ztschr. f. Geburtsch. u. Gynäk.*, xvi, 57.
- VIRCHOW: "Über die Chlorose u. die damit zusammenhängenden Anomalien im Gefässapparate." *Beitrage f. Geburtsch. u. Gynäk.*, 1868, i.
- WOOD, H. C.: *Therapeutics*. Lippincott, Phila., 1907.

CHAPTER XXXIII

STERILITY

A WOMAN may be said to be sterile when conception does not occur within several years of marriage. The truth of this statement rests upon the fact that no measures have been taken to prevent impregnation and that the male is healthy. Sterility may be either relative or absolute. Relative sterility is comparative sterility; that is, a woman may bear a child within a short time of marriage and none after that. This is frequently spoken of as one-child sterility, and is usually dependent upon an accident or a complication attending the first labor, which prevents another conception from

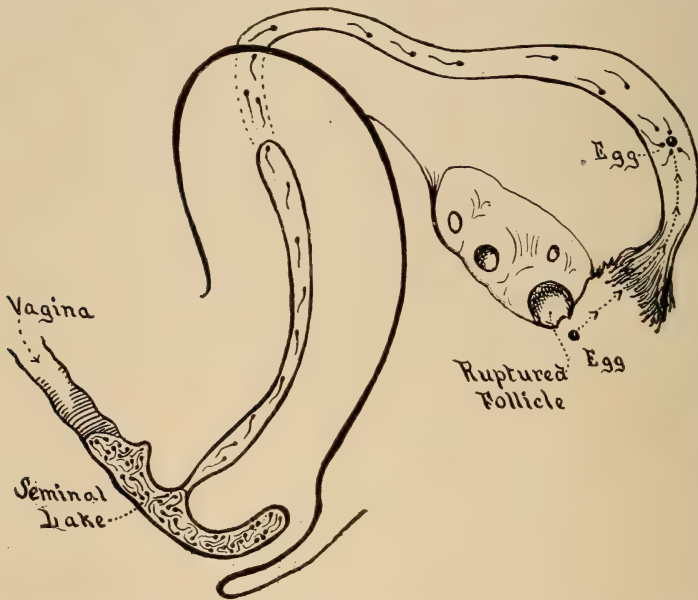


FIG. 461.—Schematic outline of generative tract showing: Escape of ovum; penetration of spermatic particles; fertilization of egg.

taking place. Before declaring that a woman is sterile one must be certain that all the conditions favorable to conception exist in the interested person of the opposite sex.

Etiology.—The causes of sterility are numerous, and include all the conditions that may interfere in any way with the physiology of normal impregnation. Conception takes place usually in the outer third of the tube; the spermatic particles by their own motility penetrate to this point, and there lie in wait for the ovum, which is discharged by the Graafian follicle, is caught up by the fimbria, and is carried down into the tube (Fig. 461). After impregnation the ovum passes slowly through the tube into the uterus;

a period of from five to seven days is believed to be consumed in its passage. In the meantime the uterine mucosa has undergone certain changes in preparation for the reception and nourishment of the gravid ovum. A more detailed description of this process can be found on page 71.

Granting that the masculine function is perfect, sterility on the part of the female may be dependent upon imperfect development or disease of any part of the genital tract that: (1) Prevents ovulation or produces unhealthy ova; (2) renders the sexual act incomplete or imperfect; (3) prevents the spermatic particles and the ovum from meeting; or (4) favors the destruction of the ovum after it has become impregnated. Polak declares that there is a definite chemico-physiologic factor in conception that is at present unexplainable which is a cause of sterility.

Imperfect Development.¹

—The ovary may be small and the ova few and imperfectly developed. This is usually a part of a general hypoplasia especially marked in the generative organs, and may be the result of ancestral syphilis, alcoholism, or epilepsy. Other causes of deficient ovulation are wasting diseases, hypophyseal and other internal glandular dyscrasias, chronic poisoning, as by lead, etc., consanguinity, and the like. The capsule of the ovary may be unusually tough and dense, and the Graafian

follicles, after attaining a certain size, may undergo regression and partial absorption—ovulation does not occur. Ovulation may be prevented by cystic degeneration of the ovary or by a persistent corpus luteum.

The Fallopian tubes may be of the foetal type; that is to say, they may be very long and greatly twisted, so that the impregnated ovum must travel a considerable distance before it reaches the uterus; hence it may perish on the way, or the tube may present diverticula in which the impregnated ovum

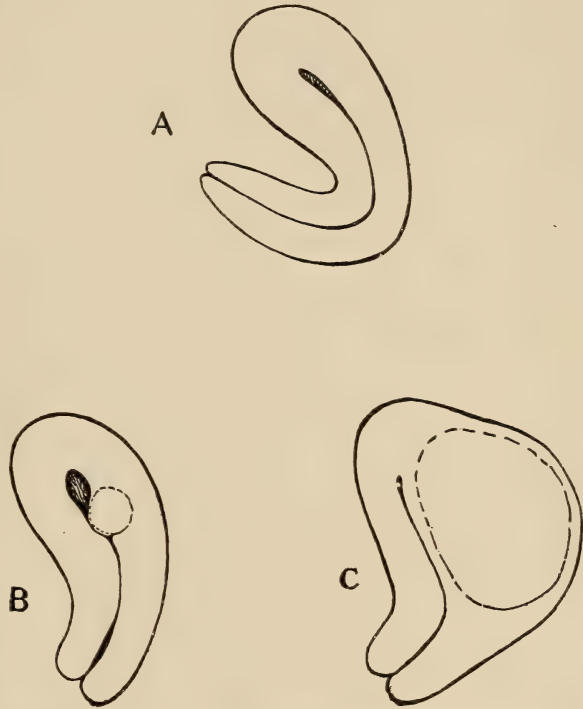


FIG. 462.—Semi-diagrammatic outline of uterus showing various causes of sterility: (A) infantile type of uterus, cervix long and stenotic with acute antelexion causing obstruction; (B) submucous myoma causing obstruction or interference with nidation; (C) interstitial myoma causing obstruction or interference with nidation.

¹For a complete list of the developmental defects of the genitalia, any of which, under certain circumstances, may be the cause of sterility, see the section on Malformations. Only the abnormalities most frequently associated with sterility as seen in practice will be discussed here.

is caught, or there may be constriction of the tube or poorly developed fimbriæ, or the musculature may be ill developed and peristalsis weak. The uterus may be of an infantile or foetal type, so that proper embedment and nourishment of the ovum cannot be provided by the small, fibrous organ, with its attenuated and poorly vascularized endometrium. The cervical canal may be stenotic, so that the spermatic particles are prevented from entering the uterus. The cervix may be so elongated and sharply anteфлекed that the seminal fluid does not bathe the external os (Fig. 462, *a*), and the vaginal fornix may be so shallow that the seminal fluid runs out of the vagina soon after coitus (Fig. 463, *b*). The vagina and vulva may be so greatly distorted as the result of malformation as to constitute a more or less complete barrier to copulation.

Acquired Diseases.—Acquired diseases that produce sterility are chiefly inflammatory in nature.² Such diseases close the abdominal ostia of the tubes by reason of adhesions (Fig. 464, *c*), obstruct the lumen of the tubes

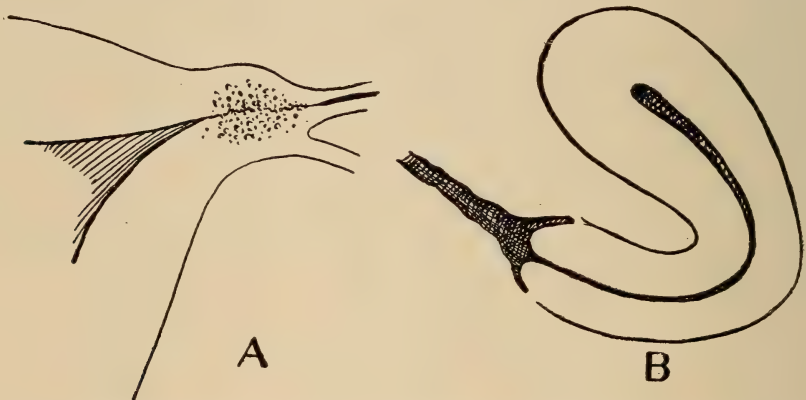


FIG. 463.—Semi-diagrammatic outline of uterus showing various causes of sterility: (A) Salpingitis or adenomyoma of interstitial portion of tube acting as an obstruction to the spermatozoa; (B) cervico-vaginal junction with shallow fornices allowing semen to escape.

by chronic inflammatory changes in the mucosa (Fig. 463, *a*), cause destruction of the ciliated epithelium; produce infiltration of the tube wall, and angulation, so that the sperm and the ovum cannot meet.

Such diseases also, by producing ovarian adhesions or a thickening of the ovarian capsule and internal circulatory changes in the ovary, may end in a premature atrophy of the Graafian follicles or interfere with the rupture of the follicle and the liberation of the ova (Figs. 464, *a* and *b*).³ Endo-

² According to Lier and Asher, the woman is responsible in 60 per cent. of sterile marriages and the man in 40 per cent.; and 33 per cent. of sterility in women is due to gonococcal infection.

³ Reynolds describes the ovaries of fertile and those of sterile women as follows: "The ovaries of a fertile woman are, then, characteristically organs of uniform outline which show not more than one thin-walled and projecting follicle or corpus. They have throughout a characteristic soft and elastic feel when taken between the fingers, except when a single mature follicle or active corpus distends one portion of an ovary and yields its characteristic tactile sensation at the point.

"In contrast, the ovaries of sterile women usually show on gross examination the presence of numerous thin-walled projecting follicles, or of numerous small, imperfect-looking corpora, or both. They are of lobulated outline, and on tactile examination between the fingers are tense and resistant in feel over the whole or at all events the greater part of the organ."

metritis, cervicitis, or vaginitis may prevent conception by generating a discharge that destroys or weakens the spermatic particle or the ovum or renders the decidua unhealthy. The normal uterine secretion is alkaline, which quality favors the activity of the spermatic particles—there is a certain attraction between the plug of alkaline cervical mucus and the spermatozoa. Excessive secretion or a purulent or muco-purulent secretion is inimical to the sperm. Excessive acidity of the vaginal secretion may prevent conception. Abnormal bacterial flora in the vagina may destroy or render less active spermatic particles deposited in the vaginal canal.

Fibroid tumors, endometrial polyps, and retroflexion of the uterus may, by mechanical obstruction to the ingress of the spermatozoa, either hinder the occurrence of conception or be inimical to the development of the ovum after it has been impregnated (Figs. 462, *A* and *B*). Such lesions prevent the union of the sexual elements, or if conception occurs, they retard the ovum's descent into the uterus, so that it perishes on the way, or render the development of the decidua so abnormal that the ovum is not properly embedded or nourished in the uterus and is soon cast off.

Functional Defects.—Functional defects may play an important rôle in the production of sterility. In order for the coitus to be fruitful it is not necessary that a woman have a keen sexual feeling or that she experience an orgasm, although both favor the occurrence of conception. The spermatic particles, if deposited at the vaginal orifice, are capable, by their own motility, of reaching the interior of the uterus and the tubes, but the completely consummated sexual act favors their penetration and increases their number. Painful contraction of the vagina (vaginismus) may be responsible for sterility. Forcible penetration in early married life may result in a hyperæsthesia of the external genitalia sufficiently marked to render complete coitus impossible.

Diagnosis.—The cause of sterility in a given case may be difficult and often impossible to determine. Some of the anatomic causes may be of such a minor degree as to render them unrecognizable. Careful observation and study of the spermatic fluid and of its behavior after it is deposited in the genital canal will often throw much light on the subject.

Hühner points out that the male should first be examined as to his ability to provide active spermatozoa. This test, as usually carried out, consists in making an examination of the semen obtained in a condom as soon as possible after coitus. There are several reasons why the mere finding of live spermatozoa in the fluid is not sufficient evidence to prove that the male

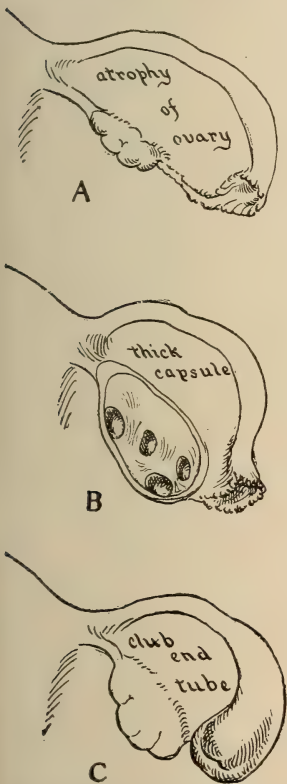


FIG. 464.—(A) Atrophic ovary, no ova produced; (B) thickened capsule (perioophoritis) preventing rupture of follicle and escape of ovum; (C) abdominal ostia of tube closed preventing ovum from entering tube.

element is satisfactory. Hypospadias or epispadias may be present, and, as a consequence, live spermatozoa may be recovered from a condom when, in the normal act, they would not reach the cervix. So, too, if emission is premature, semen that might never have entered even the vaginal tract will be found in the condom. Similarly in some cases of stricture of the urethra live spermatozoa may be found in semen that has dribbled through the stricture and been retained in the cover after withdrawal of the penis. For these reasons Hühner proposed to examine the vaginal, cervical, and uterine (fundus) secretions at varying periods of time after coitus, with a view to determining the presence of spermatozoa and their condition. For this purpose he uses a small syringe and a cannula resembling a Eustachian tube catheter.

The fundus should not be examined for a day or two after coitus, for the finding of live spermatozoa in the fundus soon after copulation may lead to the supposition that the spermatozoa may have been pushed in ahead of the examining instrument or may have adhered to it upon its withdrawal through the cervix. The examination of the fundus should, therefore, be delayed until a day or two following coitus; the finding of live spermatozoa at this time will serve to rule out any abnormal flexion or stenosis of the cervix as a cause of the sterility.

The spermatozoa deposited upon the vulva die quickly—those in the vagina within a few hours; within the cervical canal they live for a longer period and in the interior of the uterus they may be found alive after several days.

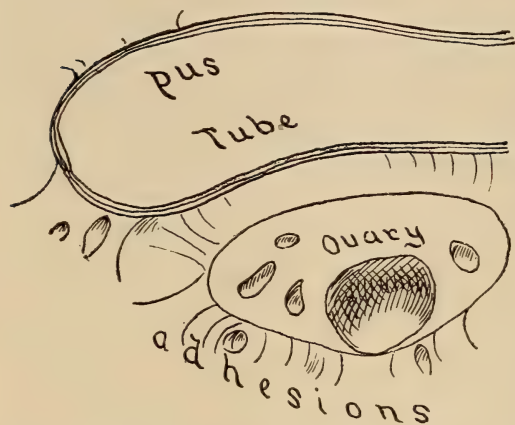


FIG. 465.—Sterility produced through gonorrhoea causing pyosalpinx, perioöphoritis and pelvic adhesions.

In conducting a test, the wife presents herself for examination within an hour of coitus; if live normal spermatozoa are found in the vaginal vault or the cervical canal, the husband is absolved from blame. If dead spermatozoa are found, a condom specimen should be obtained in order to ascertain whether the spermatozoa were dead when ejaculation took place, or whether they were destroyed later by the vaginal or cervical secretions. Ultzmann has pointed out that the spermatozoa that are dead when ejaculated have their tails curled up, whereas in those that die later the tails are straight. If live spermatozoa are found in the cervix, but not beyond an angle in the canal, this flexion must be regarded as the obstacle which prevents their penetration.

If live spermatozoa are found in the fundus, the sterility may be due to defects in the development of the uterus, such as infantilism, or to a pathologic condition of the adnexa. Should measurements of the uterus by the sound and specula and bimanual examination show no uterine maldevelopment, and if no pathologic condition of the adnexa is demonstrated on

bimanual examination, then a stenosis or a kinking of the tubes may be present or some ovarian condition may be responsible for the sterility. Should live spermatozoa be found in the cervix and dead spermatozoa be discovered in the fundus, it is to be assumed that the endometrial secretion of the uterine interior is inimical to the spermatozoa.

Hühner's method eliminates almost entirely the necessity for questioning the male, although in doubtful cases he should be subjected to a careful examination for signs of disease of the genito-urinary tract.

To this work of Hühner's may be added the important observations of Reynolds on the spermatic particles. If these are examined upon the warm stage of the microscope, either from a condom specimen or one taken from the vaginal vault after coitus, five types of spermatic particles may be distinguished: (1) The spermatozoön swims in a straight line and preferably against a current; the end of the tail lashes from side to side so rapidly that it is impossible to follow its movements; this is the first phase in the life of normal ejaculated spermatozoa, and may be called the "progressive vibratile."⁵

(2) The spermatozoön swims with much reduced speed; the tail movement is a long, slow stroke from side to side; the head and middle piece sway; the outline is of an S shape; the purpose of movement is direction more than speed; the spermatozoa seem, by a sort of tactile reaction, to avoid objects in the medium; this stage is the "undulatory tactile."

(3) The spermatozoön shows a tendency to push itself against or into any small masses of cells, bunting itself into any small cavity, and maintaining a slight burrowing motion effected by a lashing tail movement, not unlike the movements of the caudal fin of a fish. From time to time the organisms back out of the cavity and seek another mooring place. That is the "stationary bunting" phase.

(4) The spermatozoön moves forward with a spiral, screw-like process; it progresses with fair rapidity, but the swimming appears awkward and it is easily recognized. This is the "rotary swimming" phase.

(5) The spermatozoön makes progress very slowly; the middle and upper portions of the tail lose their flexibility and balance to a considerable degree, and the lower tail motion swings the forward part of the spermatozoön forward with a to-and-fro pendulum movement. This is the "pendulum swimming" phase.

The first three of these types may be regarded as normal; they take place in regular sequence in a fresh specimen; the last two types are abnormal in fresh specimens, and indicate impaired ability to fertilize. Repeated observations should be made, if possible, in order to verify the findings in a given case.

Treatment.—The treatment of sterility is as varied as the factors that produce it and in many instances, as has been said, there is great difficulty in determining the exact cause. When a pelvic examination discloses gross disease of the pelvic organs, the probable cause of the sterility is plain, and the treatment

⁵ Semen, when freshly ejaculated, is exceedingly viscid and thick. After a time it undergoes rapid liquefaction. The progressive vibratile stage rarely becomes well established until after this change has occurred.

must be directed largely to the correction of the existing disorder. In such cases the indications are clear and well defined. The difficult cases are those in which sterility is absolute, and due either to developmental or to functional defects, and those in which the acquired lesions are so slight as to render their influence doubtful. In many instances the elimination of all possible abnormalities must be undertaken in the hope that the causative factor will be removed with the others. The **developmental defects** are, of course, the most difficult to cure. The deformity most amenable to treatment is antelexion and stenosis of the cervix. For this dilatation and the introduction of a Norris stem may be curative. If, in addition, the vaginal cervix is elongated, or if it occupies an anterior position so that the external os is not in proper relation to the vaginal fornices, the lips may be split, as in Dudley's or Pozzi's operation, or Reynold's plan of lengthening the anterior vaginal wall may be adopted. If the vaginal fornices are shallow, an attempt may be made to increase their capacity by the use of tampons, and the patient may be directed to elevate the hips during coitus, and to remain in that position for several hours afterward. Mechanical impediments to coitus in the vagina and vulva, such as rigid hymen, small introitus, septate vagina, or atresia, may occasionally be relieved by operation. A rigid hymen may be excised. A rigid narrow orifice that resists dilatation by means of specula can be enlarged by cutting the anterior border of the levator muscles and fascia in each sulcus, and suturing the incision in such a way as to make the division permanent. Vaginal septa should be excised. A small, ill-developed uterus, even if no marked antelexion or stenosis is present, may be increased in size, it has been asserted, by the introduction of the stem pessary. The intra-uterine galvanic electrode has been recommended, but it is troublesome to use, requiring rigid aseptic precautions, and is of doubtful efficiency. The advisability of performing an operation for the correction of developmental defects in the hope that conception will subsequently occur must depend upon the condition of the genitalia as a whole (see Gynatresia, page 23).

If the ovaries are small and poorly developed, the outlook is doubtful. Women with defective ovarian development usually begin to menstruate late, the periods being often irregular, delayed (five to eight weeks), and scanty. These functional indications of insufficient ovarian activity are frequently found in the excessively stout and in those exhibiting evidence of a faulty or perverted internal secretion from the thyroid, adrenal, and pituitary glands. Regular exercise, proper diet, reducing the weight, the application of the stem pessary, and the exhibition of ovarian or lutein powder, desiccated thyroids, and pituitary gland extract may be useful in some of these cases.

When sterility is due to **inflammatory disease of the lower genital tract**, the treatment must be suited to the conditions present. (See the treatment of vaginitis, page 192; endocervicitis, page 224; endometritis, page 279; leucorrhœa, page 197, etc.) An infected cervix or endometrium may be cured in obstinate and chronic cases by curetment followed by iodine or phenol applied locally; if the external os is tight and the cervix is poorly drained, free lateral incisions may be made. Nabothian cysts may be punctured and

cauterized. In cervices that are greatly diseased partial amputation may be necessary. In obstinate leucorrhœa Reynolds especially recommends the use of powdered protargol insufflated into the vaginal fornices with a powder blower; after the discharge becomes scanty and colorless, aristol is substituted. If the discharge is excessively acid, a normal salt or a sodium bicarbonate solution may be prescribed to be given in the form of a douche immediately preceding coitus.

Needless to say, the proper treatment of **gross pelvic diseases** that may be the cause of sterility, operations for the removal of pelvic tumors (fibromyoma, unilateral cystoma), resection or unilateral excision of an affected tube and ovary (hydrosalpinx, cystic ovary), or restoration to the normal of a displaced uterus may be followed by conception. Sterility due to retro-position of the uterus is often amenable to replacement and the use of a pessary. A submucous myoma or an endometrial polyp may admit of easy removal and be followed by conception. In these gross cases there is no question as to the advisability of operation and treatment, and the opportunity it affords.

Among the most difficult cases are those in which no gross abnormality exists and still, from the entire aspect of the case, the presence of pelvic adhesions is suspected. Pelvic inflammatory disease may give rise to the formation of adhesions that occlude the abdominal ostia of the tubes without leaving any evidence, on bimanual examination, of the true state of affairs. A history of pelvic infection, therefore, combined with one-child sterility, may be regarded as presumptive evidence of tubal adhesions if there is no other explanation of the sterility. In cases that have resisted all other plans of treatment, and in which pregnancy is greatly desired, the entire situation may be explained to the patient and her husband, and at their solicitation exploratory celiotomy may be performed for the purpose of directly inspecting the tubes and, if need be, opening them.

When the tubes are found but slightly involved and the occlusion of the ostia is due to light and filmy adhesions, separation of the latter, followed by salpingostomy (see page 419), may effect a cure. If, however, evidences of serious trouble are found, the tubal wall being thickened and the mucosa atrophied, or the tubal plications largely destroyed or obliterated, operation does not promise much. In some unpromising cases, however, pregnancy may follow excision of an outer more seriously diseased portion of a tube and the formation of a new ostium for the inner, less severely affected portion.

In some cases light ovarian adhesions cannot be detected by bimanual palpation, and while their presence may be suspected, one cannot be certain as to their existence. They usually occur in conjunction with tubal adhesions. What has been said relative to exploratory celiotomy in suspected closure of the tubes applies equally well to the ovaries. The release of the ovary from adhesions may permit the rupture of follicles and the escape of ova which were previously lost. Operations upon cirrhotic ovaries or upon ovaries with thickened capsules or those the seat of numerous unruptured Graafian follicle cysts give little result. Excision of a corpus luteum cyst of the ovary, it has been claimed, has resulted in the resumption of

ovulation, which was temporarily inhibited by the persistent lutein tissue. If the diseased area is limited to one pole of the ovary, resection may improve the chance of conception (see page 418). Any operation on the tubes or ovaries for the purpose of removing adhesions and mechanical obstacles to the meeting of the ovum and the spermatic particles should be accompanied by thorough disinfection of the lower genital tract and excision of diseased tissue.

Ovarian Transplantation.—It is conceivable that, in the case of very seriously diseased adnexa, when it is impossible to leave any of the ovarian tissue *in situ*, a portion of the ovary enucleated from the diseased mass (autograft) or a foreign ovary (heterograft) may be transplanted into the region of a resected and freshly opened tube, and, as a consequence, conception may subsequently occur. Such cases (all autografts) have been reported, but this possibility is so slight as to be almost undeserving of serious consideration. Nevertheless, in selected cases, with the patient fully cognizant of the facts, the procedure may, at her request, be tried.⁶

Artificial Insemination.—Artificial insemination may be practised in cases in which there is a good reason to believe that the semen does not enter the uterus. Certain cases of vaginismus, stenosis of the vagina, elongation, acute antelexion, and contraction of the cervical canal may be indications for the adoption of this procedure. The semen is obtained immediately after ejaculation, kept warm, and about 0.5 c.c. of it is injected into the uterine cavity by means of a glass syringe with a long intra-uterine stem. A warm tampon covered with the remainder of the semen is placed against the external os, and the patient is kept in the recumbent posture with the hips elevated for twelve hours. Many successful results in the human have been reported, and it is well known that artificial impregnation is quite commonly resorted to in the breeding of horses. It should not be forgotten, however, that these animals are not sterile.

⁶Tuffier states that after transplantation, in favorable cases, the ovary lies dormant in its new position for several months, then becomes painful and swollen for a few days. These symptoms subside and five or ten days later menstruation appears. This investigator endeavors to leave the uterus *in situ*. He transplants the ovary about 5 cm. from the abdominal incision subperitoneally. When possible, he uses both ovaries, and has not found any regularity or rhythm in the swelling of one or the other. In 19 of his earlier homotransplants—145 altogether—he had only one failure—*i.e.*, menstruation did not appear. He says that hot flashes and vasomotor phenomena are overcome by transplants. In some cases it has been found necessary to remove the grafted ovary, but the mere fact that it is transplanted does not make it any more likely to undergo degenerative changes.

Whitehouse reports one case in which the patient menstruated for a year after ovarian transplantation. He prefers "seedling" grafts, *i.e.*, cutting the ovary into small pieces and placing these between the rectus muscle and the subperitoneal tissue. He places the ovary in Douglas' culdesac to keep it warm until he has finished his abdominal work. He draws the following conclusion among others: "It seems to be established that a small portion of ovary successfully engrafted anywhere furnishes to the subject of the graft the secretion or influence that preserves her sexuality and prevents atrophy of the genital organs and other changes in the individual that are coincident with complete castration."

Hetero-transplantation is not so successful as homo-transplantation. There seems to be a blood or tissue antagonism to hetero grafts. This is less marked in those of close consanguinity, and is not present in the case of homo-transplantations.

W. L. Estes had two cases of pregnancy following homoplastic grafts. Morris had one case, believed to be the only one on record, of pregnancy following a hetero-transplantation. Morris and Frank each report cases of pregnancy following homoplastic grafts.

The most favorable time for practising artificial impregnation in the woman is immediately after or just before a menstrual period. Careful aseptic precautions must be observed, but antiseptics must, of course, be avoided.

Artificial insemination is applicable to certain selected cases, and is likely to be efficient when other measures have failed provided there is some mechanical obstacle that cannot otherwise be avoided.⁷

Since one of the most frequent remediable causes of sterility appears to be stenosis of the cervix with anteflexion and a shallow vaginal vault, the patient in whom no gross disease can be demonstrated should be instructed to elevate the hips during coitus, and to remain in that position for at least twelve hours afterward. This prevents dissipation of the seminal lake, keeps the external os bathed in the semen for a longer period of time, and favors penetration of the spermatie particles. Intercourse should be limited to the first week after or the week before menstruation. Röhleder has recommended coitus on the last day of the period in sterile marriages with success. The alkaline menstrual blood is believed to be favorable to the life and activity of the spermatozoön. The husband should be instructed that frequent intercourse or multiplicity of ejaculation does not favorably influence the case. One completely physiologic coitus at the proper time is more valuable than numerous more or less abortive attempts.

BIBLIOGRAPHY

- BUMM: "Über Behand. u. Heilungsaussicht der Sterilität bei der Frau." Deutsch. med. Woch., xxx, 1756.
 CHALFANT, S. A.: "Subcutaneous Transplantation of Ovarian Tissue." Trans. Amer. Gyn. Soc., 1915, xl, 444.
 FRANK, R. T.: "The Clinical Manifestations of Diseases of the Glands of Internal Secretion in Gynecological and Obstetrical Patients." Trans. Amer. Gyn. Soc., 1914, xxxix, 286.
 GOLDBERGER, F. M.: "The Relation of the Cervix to Sterility and Pregnancy." Internat. Jour. Surg., 1913, xxvi, 169.
 GRAVES, W. P.: "Sterility." Trans. Amer. Gyn. Soc., 1913, xxxviii, 526.
 HÜHNER, M.: "The Practical, Scientific Diagnosis and Treatment of Sterility in the Male and Female." Med. Record, 1914, xxxv, 840; *Ibid.*: "Sterility in the Male and Female and Its Treatment." Rebman and Company, New York, 1913.

⁷Röhleder discusses the historic, moral, religious, economic, medicolegal, and technical aspects of artificial impregnation and reproduction. He refers to the necessity of examining both wife and husband, especially as regards venereal disease in the latter.

Given favorable conditions, with an apparently unknown cause, with the exception of impotentia cœundi, etc., he has found reports in the literature of *seventy-one cases* treated by the so-called uterine method (injection of semen into the uterus), with *twenty-five successes*, and four cases treated by the vaginal plan (placing the semen in the vagina), with four successes. This makes a total of seventy-five cases with twenty-nine successes. Röhleder is willing to exclude ten cases reported by Girault, whose premises do not seem to be correct, and to accept as reliable *sixty-five cases* with *twenty-one successes*.

His method is to obtain the semen immediately after a coitus, *in the first day or so after menstruation*, and, by means of a sterile and warm Braun syringe, to inject a few drops, if possible, into the uterine cavity; if this is impossible, the injection is made into the cervical canal. The remaining semen is placed on a warm tampon against the external os. The woman remains in bed for twenty-four hours, with knees together and pelvis elevated in order to retain the semen.

In his own practice Röhleder has obtained one positive (delivery at term) and one presumable success; early absorption took place in six cases. The apparent cause of the trouble in the latter was stenosis of the cervix in two, and hypospadias in four. He regards this procedure with great favor.

- MARTIN, F. H.: "Ovarian Transplantation." Trans. Amer. Gyn. Soc., 1915, xl, 33; *Ibid.*: "Ovarian Transplantation in the Lower Animals and Women." Surg., Gynec. and Obst., 1911, xiii, 53; *Ibid.*: "Progress in the Study of Ovarian Transplantation and Ovarian Secretion." Trans. Amer. Gyn. Soc., 1917, xlii, 257.
- NOBLE, C. P.: "Salpingitis and Sterility." Trans. Amer. Gyn. Soc., 1891, xvi, 480.
- NOEGERRATH, E.: Die latente Gonorrhoea in weiblichen Geschlecht. Bonn, 1872.
- POLAK, J. O.: "A Study of the Pathology in Its Relation to the Etiology with the End Results of Treatment of Sterility." Trans. Amer. Gyn. Soc., 1916, xli, 598.
- PROCHOWNIK, L.: "Ein beitrage zu den Versuchen künstlicher Befruchtung beim Menschen." Centralbl. f. Gynäk., 1915, xxxix, 145.
- REYNOLDS, E.: "The Theory and Practice of the Treatment of Sterility in Women." Jour. Amer. Med. Assn., 1913, lx, 93; *Ibid.*: "The Principles Underlying the Successful Treatment of Sterility in Women." N. Y. State Jour. Med., 1914, xiv, 4; *Ibid.*: "The Causes and Treatment of Sterility in Women." Amer. Jour. Med. Sci., 1907, cxxxiv, 209; *Ibid.*: "Forward Fixation of the Cervix as Predisposing Cause of Some Retro-deviations of the Uterus. Operation for Its Release." Surg., Gynec. and Obst., 1914, xix, 588; *Ibid.*: "Fertility and Sterility." Trans. Sec. Obst., Gyn. and Abdom. Surgery, A. M. A., 1916, 17.
- RÖHLEDER, H.: Die Zeugung beim Menschen; Mit Anhang; die künstliche Zeugung (Befruchtung) beim Menschen." Thieme, Leipzig, 1911.
- RUNGE, E.: "Beitrag zur Aetiologie und Therapie der Weiblichen Sterilität." Arch. f. Gyn., 1909, lxxxvii, 572.
- TUFFIER, T.: "Transplantation of the Ovaries." Surg., Gynec. and Obst., 1915, xx, 30; *Ibid.*: "Les Graffes Ovariennes Humaines; Suites éliognés." Jour. d. Chir., 1913, x, p. 529.
- WHITEHOUSE, B.: "The Autoplastic Ovarian Graft and Its Clinical Value." Clin. Jour., 1913, xliii, 107.

CHAPTER XXXIV

HYGIENE AND THE RELATION BETWEEN NERVOUS AND GYNECOLOGIC DISORDERS

THE HYGIENE OF ADOLESCENCE

THERE is not so much difference in the physical inclinations of the male and the female before, as there is after, puberty. During childhood the average healthy girl will be quite as active as a boy, although her activities may be along less boisterous channels. Puberty begins earlier in the female than in the male, and coincident with it there are instinctive changes in deportment and in inclinations. Although in healthy individuals there may be a disposition to give up some of the physical activities of childhood, the sexual development will not lead to serious or morbid introspection. There may be a slight indisposition about the menstrual periods, but when this has passed there will be no pelvic symptoms or indications until the next period is due. Inherited physical or mental weakness, improper hygiene, faulty habits of dress, too little exercise in the open air, ill-chosen diet, hard work, and mental anxiety may decidedly interfere with the healthy normal condition. The menstrual periods may be excessively painful, and with it leucorrhœal discharge, backache, disinclination for exercise, and morbid introspection may make their appearance.

The importance of exercise for the young woman can hardly be overestimated (see page 710). The muscles are vitally concerned with many of the metabolic processes, and the normal heat production, the expenditure of energy, the proper circulation of the blood, and the excretory activities depend largely upon healthy muscles and muscular contractions. The demands of the muscular system are not always to be found in performing household duties and never in the duties of the school-room. For that reason the young woman should be encouraged in all suitable outdoor sports, such as walking, tennis, basketball, bicycling, rowing, skating, horseback riding, and the use of dumb-bells or of Indian clubs. A healthy body is conducive to a healthy mind. School hours should never be allowed to interfere with daily exercise in the open air.

The diet is of considerable importance; the food should be plain and wholesome, and tea, coffee, candy, condiments, and alcohol in any form should be restricted.

In a healthy woman there need be no variation in the daily routine at the menstrual period. Exposure to cold and dampness should be avoided; tub-baths are usually contraindicated at this time, and shower- or sponge-baths should be substituted. To those women who experience more or less pain, rest and quiet will prove grateful.

Young unmarried virginal women who exhibit symptoms of pelvic disorders necessitating an examination should not be dealt with in the ordinary way. In selected cases a gentle, careful bimanual pelvic palpation may be attempted without anæsthesia, and inspection of the vaginal cervix and

fornices may be made with a large Kelly cystoscopic speculum, with the patient in the knee-chest or the Sims' position. Anæsthesia is usually required and generally advisable, and should be used except in simple and generally favorable cases (see Chapter VIII, page 112). Uncertain and equivocal diagnoses should not be rendered to young women, nor should tedious methods of treatment be employed for a local pelvic disorder. The patient should be dealt with by general measures or by operation. Local treatment is never justifiable in young virgins, and elusive and ambiguous terms, such as "congested ovaries," "stricture of the womb," etc., should never be mentioned to them. By adopting such a course there will be less danger of inducing morbid introspection and of engendering a psychosis that cannot fail to have an unfavorable effect upon the patient.

THE RELATION OF NEUROSES TO PELVIC DISEASES

The importance of pelvic disease in the production of neuroses in women has been greatly exaggerated. Pelvic disease in itself does not excite a neurosis, but the influence of a pathologic condition in the pelvis on the general health in a neurotic subject may predispose to the formation of one. In neurotic women the nervous condition may be associated with faulty general development in which the pelvic organs share. Thus, if a neurosis is combined with poorly developed or improperly formed pelvic organs, the neurosis may be dependent upon the same cause as the imperfect development of the pelvic organs, but one does not depend primarily upon the other. As a consequence of the physical and nervous disability, the most striking and important function of the female, menstruation, is incompletely or painfully performed. The importance that the patient attaches to the menstrual function and the anxiety aroused by any abnormality concerning it may influence the neurosis secondarily through psychic impression.

A neurosis in which pelvic pain that has no anatomic foundation is complained of has no more significance than a neurosis that produces pain in other parts of the body or in persons of the opposite sex. In women pain that is purely neurotic in type is more likely to be referred to the pelvis than to any other part of the body. This naturally leads to the fear that the pelvic organs are diseased, but it must be remembered that the symptoms may be purely neurotic and compatible with absolutely healthy pelvic organs. Such symptoms as dysmenorrhœa, backache, or dragging pain in the lower abdomen may be present without any anatomic or other recognizable cause.

On the other hand, neuroses may exist with actual acquired lesions of the pelvic organs. These lesions, through the suffering they occasion, may exaggerate the neurosis to a certain extent, and when they are cured, the patient's condition may improve to a similar degree.¹

¹ Graves distinguishes two types of "genital psychoneurosis": the first, in which there is a condition of mind continually reverting to imaginary ills in the pelvic organs, he calls the "genital neurosis of imagination"; the second, in which the mind reverts to real pelvic disorders, he terms the "genital neurosis of overvaluation." The first belongs to the neurologist and the psychiatrist; the second belongs first to the gynecologist, and later to the alienist.

In the first, the individual is conscious of functions that normally "belong to the

From these facts it is apparent that when neurotic persons complain of pelvic symptoms, it is very important to make a thorough examination, under anæsthesia, if necessary, to determine once and for all whether any pelvic lesion exists. If a lesion is present, it should be corrected at once; if there is not a lesion, or if it is of such a doubtful character that the physician is uncertain, the patient should positively be assured that her pelvic organs are healthy and her mind thus set at ease (see also pages 112 and 610).

Women with neuroses should never be subjected to local treatment unless they have a real pelvic lesion, and one that is quickly and certainly amenable to local treatment. When a neurosis coexists with actual pelvic disease, the patient should be subjected to the most effectual treatment known for the condition, whatever it may be, whether medical or surgical. In treating all neurasthenic or neurotic patients the physician should be very careful not to use terms that may fill the individual with morbid apprehension. The use of such expressions as "congestion of the ovary," "neuralgia of the ovary," and "ulcer of the womb," should be avoided.

INSANITY IN ITS RELATION TO GYNECOLOGY

Insanity is a disease of the nervous system. It is usually entirely independent of disease of the generative organs. It may be complicated by disorders of the sexual organs, or the latter, by their influence upon the general health, may favor the development of insanity, more especially in neuropathic women. When insane women present symptoms of disease of the sexual organs, it is advisable to have an examination made by an expert gynecologist, so that a correct diagnosis of the condition of these organs may be made. Insane women whose sexual organs are normal, are in no sense gynecologic cases, and should receive treatment directed to the mental condition alone.

On the other hand, an insane woman whose sexual organs are the seat of a disease that impairs her physical well-being, or that threatens her life, should receive the same treatment that would be indicated if insanity did not exist as a complication. When the history shows that the disease of the sexual organs antedated the mental disorder and that it has undermined the health of the patient, and particularly the stability of the nervous system, gynecologic treatment is much more strongly indicated than in the class of cases previously considered. In such cases, even more than in those of the first class, there is reason to expect that the cure of the pelvic disease may exert a favorable influence upon the mental condition and may assist in restoring the patient's sanity.

From the investigations of Taussig and the report of Gibson, little improvement has been noted after the operative correction of pelvic disorders in patients exhibiting some form of dementia, such as dementia præcox, general paresis, epilepsy, and senile dementia.

realm of the subconscious," such as movements of the intestines, heart, and stomach, the attention having been directed to them accidentally or by pain or some temporary aberration of function.

In the second the pelvic lesion is apt to be a minor one, which, "without causing severe symptoms, maintains a nagging discomfort and keeps the searchlight of attention constantly turned upon them." Among them may be mentioned pelvic adhesions and descensus of the uterus.

On the other hand, in those forms of insanity in which dementia does not appear, manic-depressive insanity, melancholia, and paranoia, the patient may be benefited by surgical treatment; this is especially true in cases of manic-depressive insanity.

Insanity is one of the least common *post-operative* complications, and occurs after operations upon the sexual organs with about the same relative frequency as it does after operations upon other parts of the body. It occurs as frequently in the male as in the female.

The usual type of mental disease that develops after operation is that known as confusional insanity. Neuropathic individuals and those who have undergone great physical or mental strain before operation are those in whom insanity is most apt to develop, especially if annoying and persistent painful symptoms make their appearance after operation; for example, such symptoms as infection of the bladder, leading to frequent and painful urination, and infection elsewhere, necessitating the use of dressings, with long-continued pain and annoyance incident to them. In certain cases there is no doubt that the insanity is toxic in nature and due to infection, but in most instances it appears to be due to a disturbance of the mental equilibrium, brought about by the stress and strain attending the operation, superadded to worry, grief, or mental excitement antedating the surgical procedure. Trifling operations are as apt to be followed by insanity as are those of a graver type. In Noble's experience, insanity has usually followed plastic operations and has almost never complicated hysterectomy or ovariectomy.

Confusional insanity arising after operation in a woman who possessed a normal or a fairly normal mind previous to the operation, usually ends in recovery within six weeks or sooner. In Noble's experience, comprising about twenty cases, one was fatal; the others ended in prompt recovery. These general principles may be regarded as a summary of the present views of both alienists and gynecologists concerning the relation of insanity to gynecology.

BIBLIOGRAPHY

- BROWN: "Preliminary Report of the Gynecological Surgery in the Manhattan State Hospital, West." Trans. Amer. Medico-Psychological Assoc., 1905.
 GIBSON, G.: "Gynecological Operations Upon the Insane." N. Y. Med. Jour., 1915, ci, 293.
 HOBBS: "The Relation of Insanity to Pelvic Diseases and Other Lesions." Amer. Jour. Obst., 1900, lxi, 1.
 MANTON, W. P.: "The Relations of Visceral Disorders to the Delusions of the Insane." Amer. Jour. Obst., N. Y., 1896, xxxiv.
 ROHE: "The Relations of Pelvic Disease and Psychical Disturbances in Women." Amer. Jour. Obst., 1892, ii, 694.
 SMITH, R. R.: "Notes on the Relationship Between Gynecology and Neurology." Trans. Amer. Gyn. Soc., 1915, xl, 150.
 TAUSSIG, F. J.: "Gynecologic Disease in the Insane and Its Relationship to the Various Forms of Psychoses." Jour. Amer. Med. Assn., 1912, lix, 713.

CHAPTER XXXV

THE SELECTION AND PREPARATION OF PATIENTS FOR OPERATION

THE SELECTION OF CASES

FEW operations undertaken for lesions of the generative tract are demanded suddenly or must be immediately executed. Most of them are planned deliberately and carried out at a set time. A few gynecologic diseases necessitate immediate operation; others may require it only within a limited time. In some the symptoms may be relieved by palliative measures, and operative treatment may be deferred according to the will of the patient. In many cases the operation is elective. It is, therefore, necessary for the physician to be able to determine when operation is indicated and when it may be delayed; when it is imperative, and when it is a matter of choice; which case must be handled surgically, and which will derive all possible benefit from non-operative treatment. The disease itself, the age, the general health, and the social position all have a bearing on these points. The choice between operative and non-operative treatment will often depend upon the circumstances surrounding the case.

Those diseases that usually require operation as soon as they are discovered include ectopic pregnancy, ovarian cysts, and malignant disorders in the early stage. Myomata of the uterus do not always demand treatment, but a great majority of them must sooner or later be subjected to radical surgical, radium, or Röntgen ray treatment.

Displacements of the uterus or lacerations of the cervix and perineum may require immediate operation during the child-bearing period if they are productive of marked suffering, and especially if the patient is unlikely to bear more children. If, however, the opposite is true, the patient may be tided over the active child-bearing period by adopting palliative measures, and as the reproductive age draws to a close operation may be undertaken. (See Treatment of Retroflexion, page 247.) In the extreme cases of prolapse seen in advanced years an effort should be made to relieve the patient by the use of a suitable pessary, in order to avoid an operation that is contraindicated by the age or the general condition.

In pelvic inflammatory diseases the patient should not be operated upon during the acute stages, whether they are of gonorrhœal, puerperal, or of surgical origin. It is always safer to wait until the infection has subsided, and the morphologic changes, the result of acute exudation and infiltration, have disappeared. The indication for operation in an inflammatory disease after the lesion has become chronic is somewhat dependent upon the extent of the lesion, the number of attacks of pelvic peritonitis that the patient has undergone, the symptoms which she presents, and the time that she can afford to consume to get well. Unless the patient earnestly desires to

avoid an operation and is willing to remain an invalid for a considerable time, and to carry out certain palliative measures every day, operation should be performed as soon as the chronic stage has been reached.

Dercum has shown that operations on the pelvic and other viscera for the relief of functional nervous disorders have no justification. This emphasizes the desirability of making a very careful diagnosis of the lesions in any case exhibiting neuroses. Only in this way will operations that are without benefit be avoided.

THE EXAMINATION AND TREATMENT OF PATIENTS PREPARATORY TO OPERATION

The physical and mental condition of every patient should be carefully investigated before operations of election. Since general disorders may be responsible for many, if not all, of the symptoms for which she seeks surgical advice, it is important that none be overlooked, lest the patient expect too much from the operation or be disappointed in the result. Certain diseases also contraindicate or render operation hazardous, and make it advisable to limit the procedure as much as possible, or to carry it out with additional precautions and safeguards. Care in the execution of the preparatory examinations and treatment will sometimes disclose unsuspected lesions, and in this way loss of life or, at least, unfortunate complications or sequelæ to operative treatment may be prevented.

The diseases that contraindicate operation, unless the procedure is urgently demanded to save life, include severe diabetes mellitus, Addison's disease, advanced and active tuberculosis, advanced cardiac, hepatic, or renal disorders, chronic alcoholism, etc. Anæmia, hepatic or renal inactivity, unhealthy conditions of the skin, chronic constipation, moderate degrees of cardiac insufficiency, nervous exhaustion, and mental fatigue or excitement may make it desirable that considerable time be spent in preparing the patient for the ordeal which she is about to undergo.

The condition of the part or parts to be operated on may often be improved to a considerable extent by rest in bed, the use of hot douches, and the application of suitable remedies. Thus subinvolted uteri and œdematous vaginal walls may be depleted and erosions of the mucosa may be healed. The surgeon should always endeavor to place the operative area in as healthy and aseptic a condition as possible before undertaking the surgical measures.

In certain pelvic inflammatory cases it may be some time before the infectious properties of the invading bacteria are destroyed and the inflammatory exudate is absorbed. Although this may require several weeks or months or even longer, the time will be well spent (pages 415 and 425). To this end patients should be kept in bed, or at partial rest, and the particular condition should be treated *secundum artem* until the general and the local condition have returned as nearly as possible toward the normal before the operative treatment is carried out. Thus chronic constipation and intestinal and hepatic inactivity may be overcome and a weakened circulation may be so fortified that all symptoms of insufficiency will disappear. In anæmic patients the condition of the blood may be improved, a chronic bronchitis

may be cleared up, and sluggish kidneys may be aroused to renewed activity. The mental attitude of the patient may be changed from one of terror and apprehension to one of patient confidence, and the exhausted and weakened nervous system may be rejuvenated. The individual should be placed in all respects in the best possible condition to secure rapid convalescence and to promote healing.

Cardiac Risks.—The individual cardiac lesion is of less importance than the condition of the heart muscle and the degree of compensation. An operation done under the most favorable conditions of modern surgery may be regarded as the equivalent of a very moderate unusual exertion (Reynolds). The patient should be studied in consultation with an internist, and if practicable, with the anæsthetist. With rest, suitable food, and the use of strophanthus or digitalis the patient should be kept under observation until compensation is reëstablished. "A subject of valvular or other cardiac disease, who is able to go up a flight of stairs at an ordinary walk without provoking more than slight breathlessness, is fitted to endure an abdominal operation of average grade without suffering any grave increase of the ordinary risks" (Reynolds), provided expert medical care before and after operation, thoroughly expert anæsthesia, and rapid, gentle operating are provided.

Anæsthesia should be preceded by the administration of morphine and atropin or scopolamine. Nitrous-oxide-oxygen anæsthesia without ether, or with as little as possible, should be used, with local novocaine infiltration of the operative area (see Crile's technic, page 617). The anæsthesia should be started with the patient in the reclining position.

During the early stages of the anæsthesia struggling and cyanosis are especially to be avoided. The Trendelenburg posture should not be employed, or if its use becomes necessary, it should be limited to a few minutes. During the greater part of the operation the table should be level and the shoulders of the patient should be slightly raised. Pressure on the abdominal viscera should be avoided; exposure and handling of the intestines should be limited. That plan of operation should be selected that can be consummated with a maximum of speed and a minimum amount of traumatism.

If symptoms of right-sided cardiac hypertension or acute dilatation (rise of pulse-rate, cyanosis, etc.) supervene, prompt phlebotomy, digalen and camphor, oxygen, and small doses of morphine, together with surface heat applied locally, constitute the treatment. When large intra-abdominal tumors have been removed, compensatory support and pressure should be maintained during the first few days of the convalescence.

Following the operation the patient should be closely observed by the internist, and her treatment should be directed in coöperation with him. It is most desirable to avoid excessive vomiting and distention of the stomach or intestine. This can usually be secured by careful pre-operative emptying of the gastro-intestinal tract and strict regulation of diet. If they should, nevertheless, develop after operation, such symptoms must be met promptly but with the most gentle measures that are effective.

Anæmia Risks.—Anæmia carries with it a certain operative risk, depending, of course, upon its degree and upon the associated conditions that

obtain in the individual patient. The principal causes of anæmia in gynecologic cases have been discussed elsewhere.

In a few cases it is possible to restore the blood-picture to the normal by suitable pre-operative treatment. In others such a fortunate outcome is not possible, since the etiologic factors of the anæmia—hemorrhage and toxæmia—will persist until the operation is performed. Nevertheless, in almost all instances, except when the operative procedure is to be trivial, the condition of the patient should be improved to the maximum degree. In the case of myomata that bleed periodically, suitable regulations and treatment (described on page 310) will greatly improve, and in some cases actually restore, the condition of the blood. In anæmic cases with menorrhagia the best time for undertaking the operative procedure should be just before a menstrual period is due. When anæmia is due either in part or in whole to toxæmia, especial steps should be taken to minimize the absorption of septic products and to increase the eliminating functions of the body.

Anæmia is to be regarded as especially hazardous from the operative standpoint when the hæmoglobin falls to 40 per cent. or lower. In a review of the material at the Johns Hopkins Hospital, Cullen found that in the period from 1889 to 1912 there had been 170 cases of that description. Seven were unfit for operation and died without it; in three the myomatous disease and the anæmia were the direct cause of death; in four others complications (toxic absorption, etc.) were present. Thirteen cases died after operation, death being due to peritonitis, intestinal obstruction, circulatory failure, etc. One hundred and fifty-two cases recovered, the hæmoglobin in them varying from 40 to 10 per cent. as follows:

40 to 36 per cent.	49 cases
35 to 31 per cent.	30 cases
30 to 26 per cent.	29 cases
25 to 20 per cent.	30 cases
Below 20 per cent.	14 cases

152

In serious cases transfusion should be a routine procedure either before or after operation; as simplified by Bernheim, it can be carried out in from twenty to thirty minutes. Every surgeon should familiarize himself with the technic of blood transfusion.

The resistance of anæmic patients is usually much impaired, and the post-operative treatment should be regulated accordingly. The patient should be disturbed as little as is consistent with careful stimulation and support.

Blood-pressure Risks.—High blood-pressure (hypertension) and low blood-pressure (hypotension) increase the dangers of ration and predispose the patient to apoplexy, embolism, thrombosis, renal insufficiency, angina, pneumonia, and cardiac failure. The pulse-pressure reading (*i.e.*, the difference between the systolic and the diastolic) is to a certain extent a more reliable index of these conditions than is the systolic maximum.

Hypertension may be temporary and remediable, or permanent and irremediable. Hypertension is caused by continued and intense emotions, such as worry, grief, and anger, acute or chronic infections, exophthalmic

goitre, increased intracranial pressure, cardiovascular disease, and physical changes in the walls of the blood-vessels.

While the hazard of hypertension must at times be undergone, as a rule the operation may be delayed until the risk is eliminated or at least much reduced. In the case of continued emotional disturbance, the plan of treatment will be obvious: in Graves' disease, lobectomy or ligation; in toxæmia, the control or eradication of acute or chronic infection; and in cardiovascular cases, as indeed in all cases, a meat-free diet, rest, nitroglycerine, and diversion are indicated.

Hypotension cases are principally those associated with hemorrhage and anæmia. These should be treated as has been described. Here transfusion is a sovereign remedy when the operation cannot be deferred.

Crile's Anoci Association.—In performing operations upon cases of hypertension and hypotension, the procedure of Crile, known as anoci association, should be followed. His own description of this method is as follows:

"Our complete technic in abdominal operations is as follows: When the pre-operative strain is great, an hour or so before the operation we administer to the patient a hypodermic injection of $\frac{1}{8}$ of a grain of morphine and $\frac{1}{150}$ of a grain of scopolamine, that he may receive the solace and quiet which come from the use of these drugs. The inhalation anæsthetic may be administered in the patient's room; or else in the apathetic state produced by the morphine and scopolamine, the patient, with eyes and ears closed to external impressions, is conveyed to the operating room, where a specially trained anæsthetist administers nitrous oxide. When the patient is anæsthetized, the division of tissue is preceded by nerve blocking by means of the local administration of 1:400 novocaine. Each division of tissue in the course of the operation is preceded by the infiltration of this local anæsthetic, the blocking being made so complete that no nerve is left free to carry a single activating impulse to the brain. First the skin, therefore, then the subcutaneous tissue, then the fascia, and finally the remaining muscle or posterior sheath and the peritoneum are in turn novocainized, subjected to momentary pressure to spread the anæsthetic, and then divided within the blocked zone. If the blocking has been complete, then upon opening the abdomen there will be found no increased intra-abdominal pressure, no tendency to expulsion of the intestines, and no muscular rigidity.

"The peritoneum is next everted, and a 0.5 per cent. solution of quinine and urea hydrochloride is massively infiltrated at a distance from the incision about the line of proposed sutures, and as before, the parts are then subjected to momentary pressure. This infiltration serves as a block, and as its effects last for several days, it should prevent or at least minimize the post-operative wound pain and the post-operative gas pain, and thereby minimize post-operative shock. Quinine and urea cause a certain amount of œdema of tissue which lasts for some time after the wound is healed. The relaxed abdominal wall will permit exploration of the entire abdominal cavity with ease. If there is no cancer nor acute infection in the field of operation, then the following regions may be blocked as completely and in the same manner as the abdominal wall—the mesoappendix, the base of the

gall-bladder, the uterus, the broad ligaments and the round ligaments, the mesentery, and any portion of the peritoneum. After a hysterectomy the stumps may be completely infiltrated with quinine and urea hydrochloride, thus giving a degree of anæsthesia for at least two days. On account of the absence of nociceptors, operations on the stomach and intestines made without pulling on their attachment cause no pain, and hence the novocaine infiltration of these viscera is not required. If the brain has received no stimuli during the operation, then the closure of the upper abdomen is as easy as the closure of the lower—all is done with the ease of relaxation. What is the result? No matter how extensive the operation, no matter how weak the patient, no matter what part is involved, if anoci technic is perfectly carried out, the pulse-rate at the end of the operation is the same as at the beginning. The post-operative rise of temperature, the acceleration of the pulse, the pain, the nausea, and the distention are minimized or wholly prevented.

“As the operation does not end in the operating room, so the protective effects of this technic follow the patient to his room, and help him far on the road to easy recovery. Post-operative pain is wholly eliminated if quinine and urea hydrochloride are injected into the entire wound; post-operative gas pain is largely or wholly prevented; painful scar is eliminated; and post-operative nervousness and aseptic wound fever are avoided. The patient quietly, with care-free mind and comfortable body, passes quickly to complete recovery from the disease, at least, for which operative procedure was required, while the very condition which made an operation seem a menacing danger may also have been relieved.”

Kidney Risks.—Under kidney risks may be grouped those cases that show kidney insufficiency and those that show the presence, in the urine, of some constituent that is indicative of metabolic disturbance.

A small amount of albumin and a few hyaline casts in the urine do not contraindicate operation, but call for the exhibition of water and the regulation of the diet, and indicate that the operation should be delayed until the urine has cleared up or until functional tests show that the kidney excretion is within the bounds of safety.

Granular casts, except in very small numbers, indicate a more active and recent lesion of the kidney, and imperatively demand preparatory treatment; thus rest in bed, a milk diet, and a simple diuretic will, in a majority of cases, result in rapid improvement and a disappearance from the urine of the abnormal constituents. Nevertheless, in such cases, the tests of the functions of the kidney should always be made. Albuminuria without casts means excessive consumption of animal food or contamination of the urine with pus or blood—the source of the latter must be determined, and a filtered specimen examined for albumin, in order to determine whether the albumin is excreted with the urine or is due entirely to the admixture with blood or pus (see ratio of albumin to pus corpuscles per cubic centimeter, page 110). Albuminuria without casts, except as the result of errors in diet, is very unusual.

Indican in the urine is an indication of intestinal torpor and absorption. It usually disappears after thorough catharsis and evacuation of the intestinal tract.

Bile in the urine indicates the presence of hepatic or biliary complications—it has no significance beyond that of the lesion which produces it.

Acetone in the urine is an evidence of a disturbance of metabolism, and is found in starvation, carcinoma, high fever, glycosuria, and diabetes. It is an important finding, and demands careful investigation and treatment. Aside from the significance and treatment of the underlying cause, patients with acetonuria should receive sodium bicarbonate by the mouth, and before proceeding with an operation enteroclysis or intravenous injections should be given until the symptom disappears. After the operation the sodium should be given in order to obviate the development of acetonuria, which is particularly prone to develop in such subjects after ether or chloroform narcosis.

Diacetic acid has the same import as acetone in the urine, but to a greater degree. It is most frequently found in diabetes or in connection with serious metabolic disturbance of the liver; occasionally its presence may be explained by a marked decrease in the ingestion of carbohydrates. As with acetonuria, the significance and the treatment vary with the underlying lesion.

Sodium bicarbonate should be used freely in the pre-operative and post-operative treatment.

In operations that involve the kidney itself, and especially in nephrectomy, an estimation of the renal function is particularly important. (For a discussion of the question see Tuberculosis of the Kidney, Chapter XXV, page 477; also Chapter IX, page 158.)

An abnormality in the urinary constituents and a moderate diminution in the kidney function need not be regarded as contraindicating a contemplated operation that will rid the patient of a lesion that has predisposed to or aggravated the kidney disorder (*e.g.*, the removal of a pelvic tumor that presses upon the ureter, etc.). Under these circumstances medicinal treatment alone will not suffice to clear up the condition.

BIBLIOGRAPHY

- BERNHEIM, B. W.: Blood Transfusion, Hemorrhage and the Anemias. Lippincott, Phila., 1917.
- BRACKETT, E. G., STONE, J. S., and LOW, H. C.: "Aciduria (Acetonuria) Associated with Death after Anæsthesia." Boston M. and S. Jour., 1904, cli, 2.
- CRILE, G. W.: "The Newer Methods of Reducing the Mortality of Operations on the Pelvic Organs." Trans. Sect. O., G. and A. S., A. M. A., 1913, 37; *Ibid.*: "The Relation between the Blood Pressure and the Prognosis in Abdominal Operations." Trans. Am. Gyn. Soc., 1913, xxxviii, 179.
- CULLEN, T. S.: "Operations on Patients with a Hemoglobin of 40 per cent. or less." Trans. Am. Gyn. Soc., 1913, xxxviii, 248.
- FAUGHT, F. A.: Blood Pressure. Saunders, Phila., 1916.
- FLEXNER, S.: "A Statistical and Experimental Study of Terminal Infections." Jour. Exp. Med., 1896, ii.
- FREUND: Beziehungen der weiblichen Geschlechtsorgane zu andern Organen. Lubarsch u. Ostertags Ergebniss den allgemeinen Pathologie, Wiesbaden, 1898.
- FREUND, H. A.: "The Diagnostic Value of the Electro-Cardiograph before Gynecological and Obstetrical Operations." Trans. Am. Gyn. Soc., 1913, xxxviii, 210.
- NOBLE, C. P.: "Personal Experience in Operations Upon Diabetic Patients." Amer. Med., 1903, vi, 13.
- POLAK, J. O.: "The Conduct of Gynecological Operations in the Presence of Acute and Chronic Endocarditis." Trans. Am. Gyn. Soc., 1913, xxxviii, 112.
- REYNOLDS, E.: "Conduct of Gynecological Operations in the Presence of Chronic Affections of the Heart." Trans. Am. Gyn. Soc., 1913, xxxviii, 368.

CHAPTER XXXVI

OPERATIVE TECHNIC

THE technic of an operation comprises, first, the methods used in the preparation of the patient, the operative area, the operator and his assistants, and the operating room; the sterilization of the instruments, the dressings, and the utensils that are to be used in the course of the operative procedure.

The principle underlying operative technic is that of asepsis—that is, the exclusion of infectious agents from the field of operation. To this end those who are directly concerned with the operation, the room in which the operation is to be done, and the utensils or the dressings that are used must be suitably prepared and protected from contamination during the course of the operation.

GENERAL PREPARATION OF THE PATIENT

It is important to have the gastro-intestinal canal empty or nearly so. An active cathartic should be given twenty-four hours (in lower intestinal, sigmoid and rectum cases, thirty-six hours) before the time set for the operation. Castor-oil, 1 fluidounce, or one or two compound cathartic capsules¹ are the most effective. Thereafter the diet should be liquid, or at most semi-solid, and easily digestible. At least three hours before the time set for operation an enema of epsom salts (2 ounces), glycerine (2 ounces), sweet oil (4 ounces), and water (1 pint) should be injected into the sigmoid by means of a rectal tube. After the bowels have ceased to act, the rectum should be irrigated with salt solution until the water returns clear.

No food, liquid or solid, should be given within twelve hours of the operation, although an occasional sip of water or of weak tea may be allowed. If the operation threatens to involve the upper intestinal tract or the stomach, for three days preceding the operation the food and drink should be as nearly sterile as possible (boiled water and milk; cooked or roasted food served hot).

An antiseptic mouth-wash and a tooth-brush should be used several times a day, and if there is any likelihood of food retention, lavage may be practised just before the anæsthetic is administered. The night before the operation the patient should be given a full bath, with special attention to the axillæ, umbilicus, and pubes. Fresh night-clothes and a change of bed linen should be provided.

PREPARATION OF THE OPERATIVE AREA

Perineal Operations.—The hair about the pubes and vulva should be removed with scissors and safety razor. If the operation is solely a perineal

¹ R Ext. colocynthidis comp. gr. 1 $\frac{1}{3}$,
 Hydrarg. chloridi mitis gr. 1,
 Resin. Jalapæ gr. $\frac{1}{3}$,
 Cambogiæ pulv. gr. $\frac{1}{4}$
 Misce et fiat one capsule.

one, in clean cases no other local preparation is necessary until the patient is under anæsthesia.

In infected cases, such as sloughing fibroid tumor or retained secundines, preparatory vaginal douching with formalin (1:1000) may be carried out several times prior to the operation. When a deodorizing solution is required, lysol (1 per cent.) or a weak solution of potassium permanganate (1:5000) is satisfactory.

After the patient has been anæsthetized the vulva, vagina, anus, and the adjacent parts should be scrubbed with green soap and hot water, and rinsed with sterile water and bichloride solution (1:1000).

When an intravaginal operation is to be performed that will possibly involve the peritoneal cavity, *e.g.*, anterior or posterior vaginal celiotomy, vaginal myomectomy, or hysterectomy, it is advisable to prepare the patient as if a celiotomy were contemplated, for sometimes it will be found requisite to switch from the vaginal to the suprapubic route, and then such previous abdominal preparation will stand the surgeon in good stead.

Abdominal Sections.—The pubes and abdominal surface should be shaved; no other local preparation need be given until the morning of the day of operation. On this day, after the bowels have been cleared out, and with no previous wetting of the skin, the abdominal surface, from ensiform to pubes, and from flank to flank, is painted with a 5 per cent. solution of iodine crystals in 95 per cent. alcohol. After the solution has dried the surface is covered with sterile gauze held in place by a binder. When the anæsthetic has been administered, and just before the operation is begun, the iodine application to the abdominal surface is repeated.

PREPARATION OF THE OPERATOR AND ASSISTANTS

No one should engage in an operation who has, within twenty-four hours, been exposed to a contagious disease or is in ill health. Those who have unavoidably or accidentally come in contact with such diseases as scarlet fever and diphtheria should not enter the operating room until they have had an opportunity to disinfect their clothing and take a full tub-bath and a shampoo. No one should take part in an abdominal operation whose unprotected hand has come in contact with pus or infectious fluid of any kind. If, during such exposure, the hands were protected with rubber gloves, there will be no risk of spreading infection provided the gloves were whole and in removing them the hands were not contaminated. If there is any reason to fear infection, it is a good plan, as a rule, to allow twenty-four hours to elapse before another operation is undertaken, whether or not gloves were worn. Those engaged in surgical work should carefully avoid soiling their hands with discharges or excretions of any kind. In making pelvic examinations, dressing wounds, etc., the wearing of rubber gloves should be made the rule.

The clothing worn by the operator and his assistants should be such that it can readily be cleansed and disinfected, and should preferably consist of muslin trousers, sleeveless shirt, and rubber-soled canvas shoes. Sterilization of the clothing is usually not required after laundering; but clothes that have become soiled with infectious fluids should be soaked in a disinfecting solution before sending them to the laundry. Shoes should be washed and redressed after each use.

Nurses should wear fresh linen suits and canvas shoes. The heads of the operator, assistants, and nurses should be covered with gauze or muslin caps. The hands and arms should be disinfected by scrubbing them from the finger-tips to the elbows with hot running water and green soap, using a moderately stiff nail-brush or a wash-cloth, for at least ten minutes. During this preparatory scrubbing the nails should be trimmed and cleaned.

After the preparatory scrubbing a disinfecting solution should be used—alcohol and bichloride solution make a suitable combination. Two minutes should be consumed in scrubbing the hands and arms with alcohol, and one minute, at least, in immersing the arms and hands in a 1:1000 bichloride solution. If alcohol alone is used, the alcohol scrub should last three minutes. The time consumed in the preparation should be accurately timed by the clock. The hands should be dried with a sterile towel and dusted with sterile talcum.

After disinfection of the hands and arms has been accomplished, the surgeon should put on a sterile gown, with sleeves long enough to reach below the wrists. Dry, sterile gloves well dusted with sterile talcum powder should then be drawn over the hands. The sleeves at the wrists are tucked under the gauntlets of the gloves. Care should be taken to see that the gloves are air- and water-tight. If facilities for preparing gloves by the dry method are not at hand the gloves should be boiled, but the dry method is vastly superior. Boiled gloves may be put on more easily if they are first filled with sterile water. When an abdominal section is to be performed gauze masks for the nose and mouth should be worn by the operator and his assistants.

PREPARATION OF DRESSINGS AND UTENSILS

Towels, sheets, gauze pads and dressings, cigarette drains, etc., should be sterilized in the autoclave, and exposed to a temperature of 212° F., under a pressure of forty pounds, for an hour on three successive days (fractional method). The dressings, etc., should be wrapped singly or in packages of convenient size, to protect them from contamination after removal from the autoclave.

Basins and rubber or glass drainage-tubes should be boiled for twenty minutes. Glass jars and hard- or soft-rubber materials that are too bulky or that might be injured by boiling should be sterilized by scrubbing with hot water and soap and then immersing them for at least one-half hour in a warm solution of mercury bichloride (1:500).

Linen or celloidin thread should be cut into lengths of six feet, wound upon glass bobbins, and placed within glass ignition tubes, well stoppered with non-absorbent cotton, and sterilized in the autoclave by the fractional method. Silkworm gut should be rolled into rings (six strands to a ring), placed within well-stoppered glass ignition tubes, and sterilized in the autoclave, or the silkworm gut may be boiled with the instruments.

Catgut is prepared in various ways that need not be discussed at this point. A method that has been used with greatest success consists of first hardening the catgut by soaking it in a 10 per cent. solution of formalin, drying it out thoroughly, and then submitting it to the cumol process of sterilization.

Any method, however, that produces strong, flexible, sterile gut that

will not be absorbed in less than ten days will serve the purpose. Many of the commercial guts on the market are highly satisfactory and may be used with good results. The best are those in which the gut is enclosed in sealed glass tubes containing alcohol and chloroform. The precaution should be taken, however, to boil the glass tubes for five minutes before using them, in order to sterilize the outer surface, or, if the gut will not stand this boiling, the tubes should be scrubbed thoroughly with hot water and soap, and then immersed in a bichloride solution (1:500) for thirty minutes. In gynecological work chromic gut is generally more satisfactory than the plain, since it has greater strength and is not absorbed so quickly. The smallest caliber compatible with safety should be used. Plain catgut of small caliber is useful for the ligation of small vessels. The choice of the catgut depends, however, upon the individual preference of the operator.

PREPARATION OF THE OPERATING ROOM AND FURNITURE

The ceiling, sides, and floor of the room should be of such material that they may be washed or scrubbed without injury. At the close of an operating day the room should be thoroughly aired; the furniture should be washed with soap and hot water, and then thoroughly gone over with a solution of bichloride or formalin (1:1000). The floor of the room should be scrubbed with soap and hot water. The room should then be closed and kept so until the next operating day, when the furniture should be washed with a solution of bichloride or formalin (1:1000).

PREPARATION OF WASH-WATER

The water used for washing the hands or for making up solutions for the purpose of cleaning the room or the furniture may be taken directly from the house taps, provided it has been filtered and is clean. Water that is used for other purposes, *e.g.*, for disinfecting solutions for the hands, for irrigating solutions, and for all general operative purposes, should be taken from steam sterilizers, or boiled for at least one-half hour and then allowed to cool in closed vessels. Sterile water or salt solution for use in the abdominal cavity should be kept in flasks of one liter capacity, and sterilized in the autoclave on three successive days for one hour.

PREPARATION OF INSTRUMENTS

Non-cutting instruments should be sterilized by boiling for twenty minutes in water containing sodium sulphate 1 per cent. The edges of knives and scissors are dulled by prolonged exposure to heat. Such instruments may be sterilized by scrubbing them thoroughly with soap and water and immersing them in an 80 per cent. alcohol solution for thirty minutes. After operation the instruments should be cleaned carefully in running water, boiled, polished, oiled, when necessary, and placed in a closed cabinet.

VENTILATION AND LIGHTING

The operating room should be ventilated by means of a forced draft fan placed in one corner of the room near the ceiling; the inlets should provide fresh air warmed during its passage into the room.

For artificial illumination of the operating room an indirect method will be found preferable, since it obviates glare. For illumination of the operative field the electric bulbs may be hung directly above the table, or, in order to avoid shadows, they may be placed at equal intervals in the form of a circle. In deep pelvic work it may at times be found useful to have a portable light of high power that may be directed at will toward any desired area. Daylight, preferably from the north, is the most satisfactory

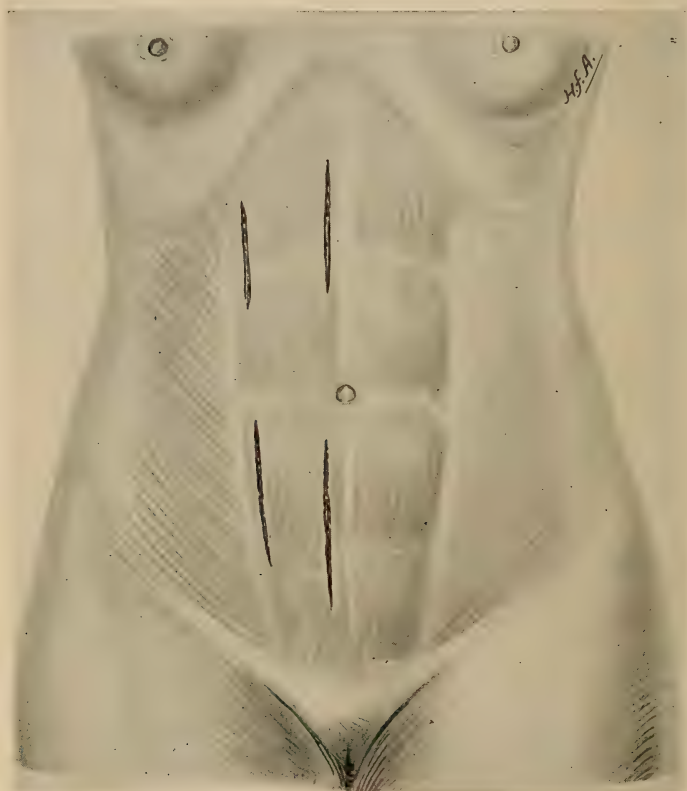


FIG. 466.—Abdominal incisions: low paramedian, right or left lateral, high paramedian, high right lateral.

form of light. It is desirable to have the windows on the north side of the room extend to the floor level, so as to provide good daylight for vaginal and plastic operations.

THE ABDOMINAL INCISION

Low Paramedian Celiotomy Incision.—The incision for exposure of the pelvis should be made slightly to the right or left of the linea alba, from a point below the umbilicus to the symphysis; the fascia of the rectus muscle is cut; the muscle is pushed to one side, or the muscle-fibers are separated by blunt dissection, carefully avoiding or ligating the deep epigastric branches (Fig. 466). If it is desired to increase the upper limits of the

incision, this may be continued to the right or the left around the umbilicus. Such an incision can be closed with more security than one made directly in the median line through the linea alba, the muscle-fibers buttressing the overlapped fascia of the rectus.

Right or Left Lateral Celiotomy Incision.—A right or a left lateral celiotomy incision may be made along the outer border of the rectus muscle, from about the upper level of the umbilicus downward (Fig. 466). The fascia is divided close to the linea semilunaris, and the outer border of the

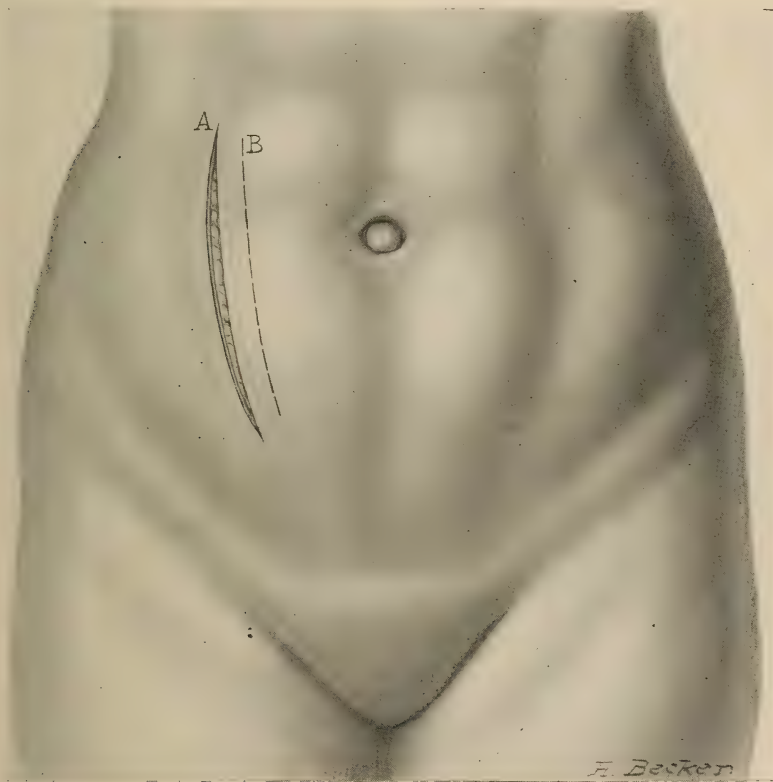


FIG. 467.—Battle's incision: (A) skin incision; (B) fascial incision.

rectus muscle is retracted toward the median line. Such an incision is especially useful when made on the right, since it affords easy access to the appendix and has an advantage over a gridiron incision in that it permits an exploration of the pelvis and upper abdomen to be made at the same time. In making the incision the deep epigastric vessels must be carefully retracted, or as is usually more practical in the average case, divided between ligatures (Figs. 467 and 468).

High Paramedian Celiotomy Incision.—For exposure of the viscera of the upper abdomen the incision is usually carried through the right rectus muscle, either close to the median line or along its external border, midway

between the costal border and the umbilicus (Fig. 466). In operations on the liver and hepatic flexure of the colon the incision is made along the external border, and may be extended above by continuing it one-half inch below and parallel to the costal border, as far as the ensiform.²

An incision close to the midline is usually selected for operations on the stomach, duodenum, pancreas, and transverse colon. For operations on the spleen the incision is made preferably through the outer border of the left rectus muscle.

Transverse Suprapubic Incision.—The transverse suprapubic incision is

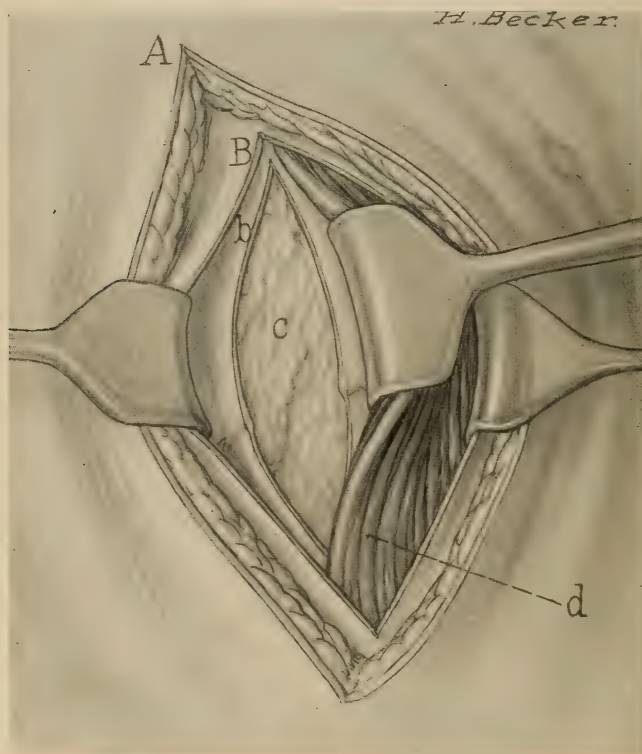


FIG. 468.—Battle's incision. (A) skin incision through semilunar line; (B) incision through anterior lamella of rectus; (b) incision through posterior lamella of rectus and peritoneum; (c) omentum showing through incision; (d) rectus muscle turned toward median line.

bow-shaped, with its central point about an inch above the symphysis, and either extremity curving slightly upward toward the anterior-superior spine. It is carried through the skin and fat; the flap of skin is separated from the underlying tissues and turned upward, exposing the fascia of the rectus and the external oblique. The fascia and fibers of the rectus are dealt with as in the usual median incision.

The cicatrix of a transverse suprapubic incision is hidden by the growth

² A number of incisions have been proposed for frank gall-bladder and gall-duct cases. For a description of them the original papers of Mayo-Robson, Bevan, and McArthur should be consulted.

of the pubic hair. This incision is particularly adapted to operations for retroposition of the uterus in uncomplicated, clean cases.

Mackenrodt recommended and practised a bow-shaped incision on the line of an arch from one anterior spine to the other. The fascia and fibers of the rectus and oblique muscles were divided transversely, as was also the peritoneum as far as the deep epigastric vessels on each side. This incision gives excellent exposure, but is not popular, since it possesses no advantage over a long right or left rectus incision.

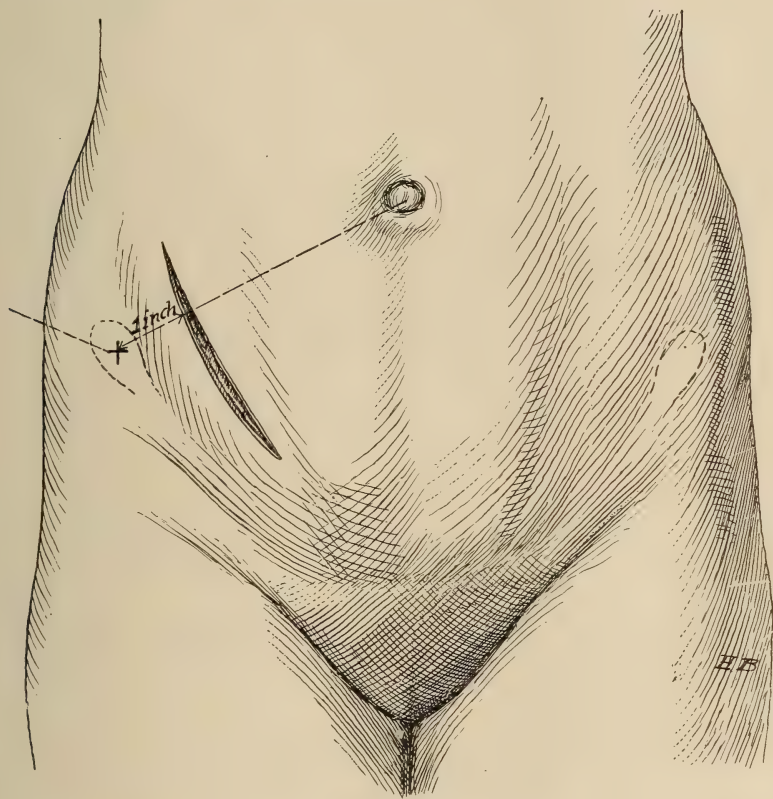


FIG. 469.—McBurney's incision; skin incision.

Gridiron Incision.—Operations for removal of the vermiform appendix in uninfected cases may conveniently be made through a muscle-splitting incision, with the central point over the base of the appendix (Figs. 469 to 472). The great advantage of such an incision is that it leaves the strength of the abdominal wall unimpaired. Such an incision should not be used in acute cases, except in the earliest stage. When a mass is palpable and protection of the surrounding areas is desirable, the right lateral celiotomy incision should be preferred. If the muscle-splitting incision is selected, and upon opening the abdomen is found to be inadequate, it may be enlarged according to Weir's plan, or it may be closed and a second right rectus incision made.

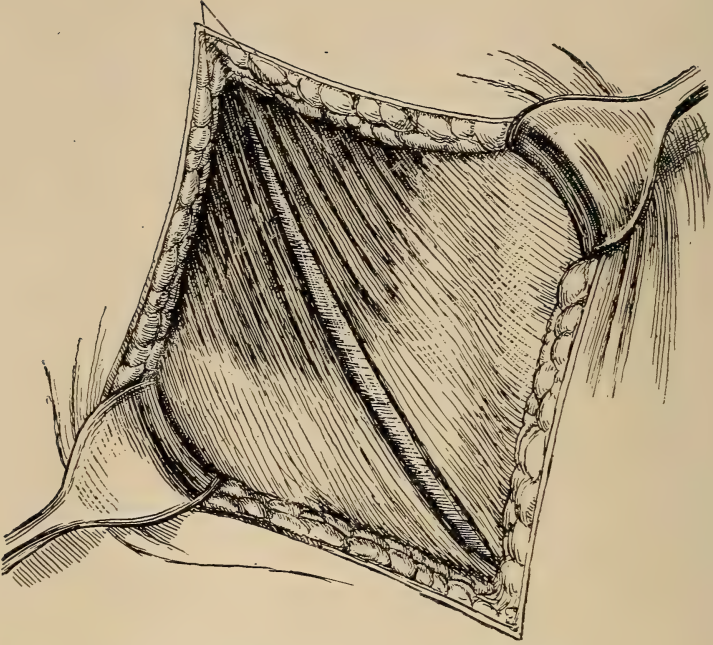


FIG. 470.—McBurney's incision; external oblique split.

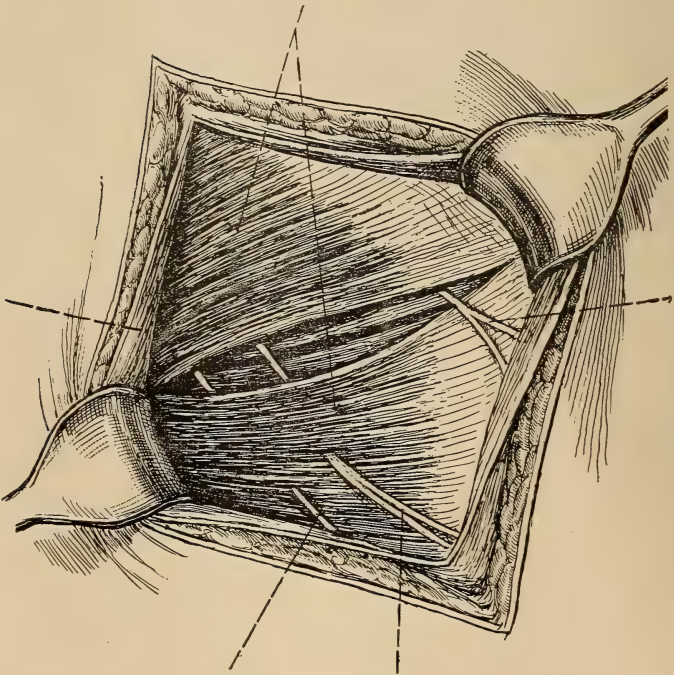


FIG. 471.—McBurney's incision; internal oblique split.

In order to enlarge the gridiron incision Weir continues the transverse split of the internal oblique and transversalis muscles through the sheath of

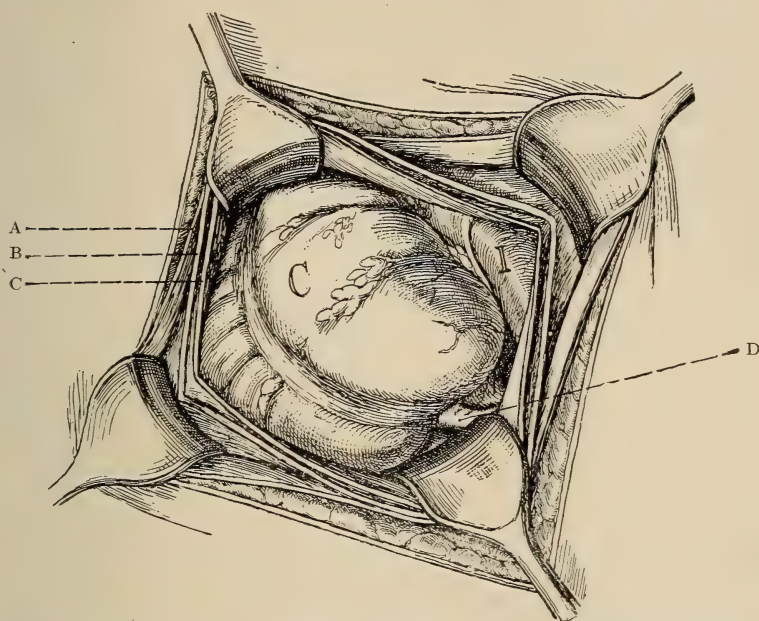


FIG. 472.—McBurney's incision: cæcum, ileum and appendix protruding into incision. (A) External oblique; (B) Internal oblique; (C) Peritoneum; (D) Appendix.

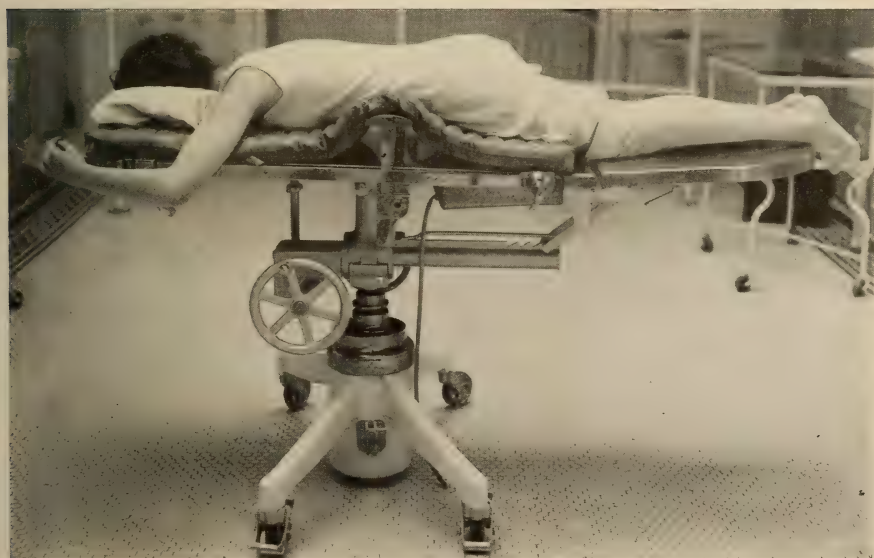


FIG. 473.—Prone position for kidney operations.

the rectus, cutting the anterior sheath along with the external oblique fascia, pulling the border of the rectus toward the midline, and then cutting the posterior sheath (transversalis fascia) in combination with the peritoneum.

In cases of high-lying and bound-down appendices that cannot be delivered through the first incision, Judd enlarges the incision through the external oblique aponeurosis as much as necessary, and makes a second incision through the internal oblique and transverse muscles $1\frac{1}{2}$ to 2 inches higher than and parallel to the first.

Kidney Incisions (Fig. 473).—For exposing the kidney and ureter several incisions may be used. For exposure of the kidney alone in the loin, as in nephrorrhaphy or nephrotomy, Kelly's incision is the most useful. For lumbar

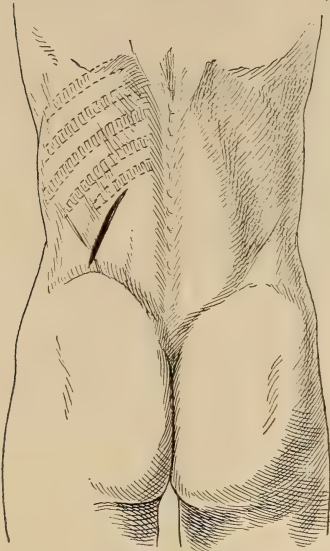


FIG. 474.—Kelly's incision.

nephro-ureterectomy either Mayo's or Israel's incision is well adapted. If the kidney is to be removed transperitoneally, a straight incision through the outer border of the right rectus muscle will be satisfactory. In uncomplicated nephrectomies, when the kidney is not greatly enlarged, the muscle-splitting incision of Robson is most useful.

Kelly's Incision.—Kelly finds the superior lumbar triangle the most satisfactory avenue for the exposure of the kidney, except in malignant cases (Fig. 474). The boundaries of the triangle are the posterior margins of the oblique muscles of the abdominal wall, the quadratus lumborum, and the twelfth rib. Its floor is formed by the aponeurosis of the oblique muscles, and the latissimus covers it. The oblique incision which Kelly uses is about three inches long, extending

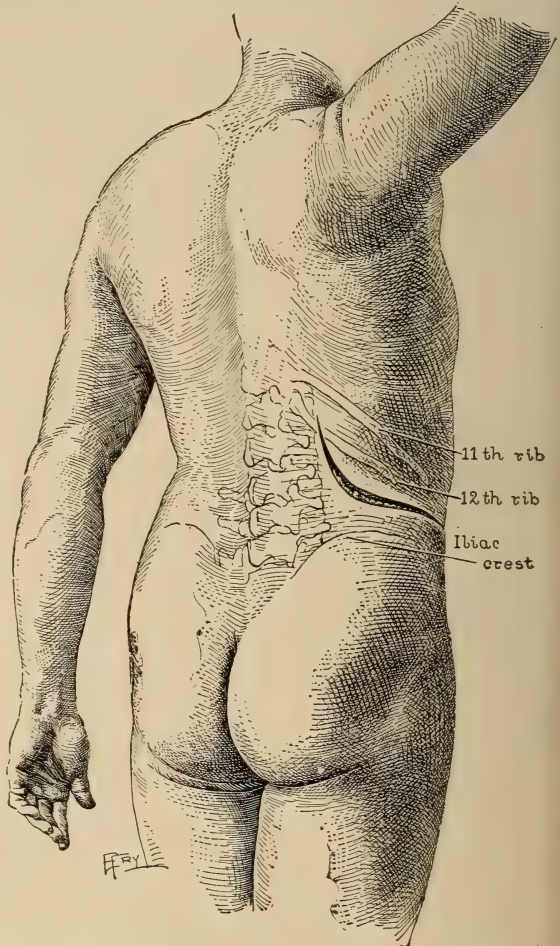


FIG. 475.—Mayo's incision. (Courtesy Surgery, Gynecology and Obstetrics.)

downward and outward from the little, soft, yielding spot in the angle between the quadratus lumborum and the rib, exposing the latissimus, which can be lifted up like a lid or separated in the direction of its fibers or simply divided transversely. The whitish area of the apex of the triangle is thus exposed. A pair of closed forceps is then pushed through the aponeurosis and withdrawn, when the golden-yellow fat pops out. The opening is enlarged by blunt force, giving command of the entire field without the ligation of a single vessel. Enlargement of the incision is easily effected by further separating the oblique muscle-fibers, or by dividing them in a direction downward and outward. Care must be taken not to injure either the last dorsal or the first lumbar nerve (Kelly).

Mayo's Incision for Lumbar Exposure of the Kidney.—Beginning at a point two or two and a half inches lateral to the dorsal spines, near the outer margin of the erector spinæ muscle, a longitudinal incision is made, two to three inches in length, through the skin, superficial fascia, and posterior layer of the

lumbodorsal fascia (vertebral aponeurosis) that covers the erector spinæ muscle. The incision lies behind the twelfth rib, from the angle, if present, nearly to the head, and reaches downward to a point one-half inch below the angle. From this point the incision passes obliquely downward and forward along the anterior margin of the quadratus lumborum muscle to a point an inch above the crest of the ilium, and, turning, runs forward parallel to the iliac crest as far as is necessary (Figs. 475 and 476).

The posterior superior lumbar triangle (Kelly) just beneath the twelfth rib is then exposed by cutting an opening through the external and internal oblique, transversalis, and latissimus dorsi muscles, exposing the transversalis fascia in its lumbar portion. This fascia is then opened freely, ex-

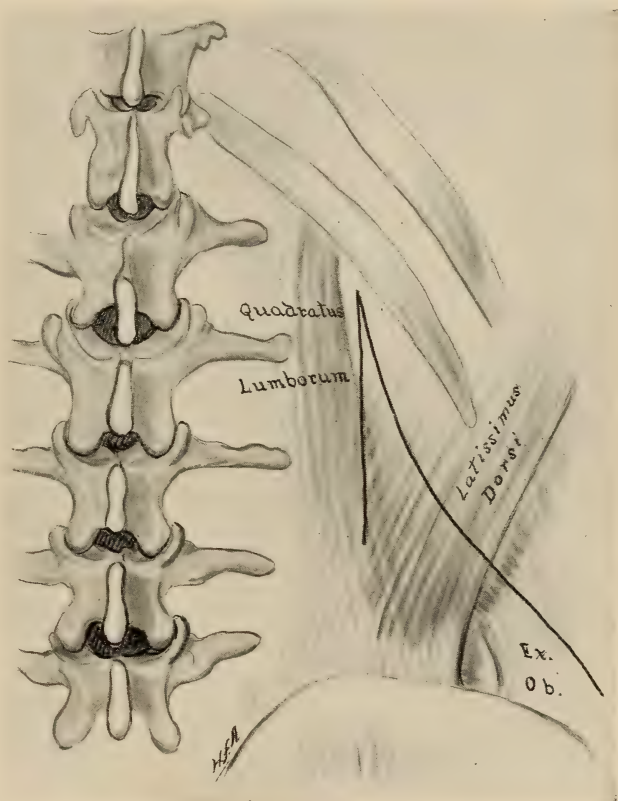


FIG. 476.—Muscles of lumbar area, showing outline of Edebohls' incision and Mayo's incision.

posing the perirenal fat. The ilioinguinal and iliohypogastric nerves are identified and retracted out of the operator's way, and the lower part of the incision completed. The twelfth rib is then cleared in its posterior portion upward and backward to a point near to the articulation of the rib with the transverse process of the twelfth dorsal vertebra, and the pleura pushed upward. By retracting the erector spinæ muscle, on the one hand, and the costal margin, on the other, a wide exposure at the point of previous inaccessibility is effected. As a rule, the kidney can readily be drawn through the incision to the surface with but little traction. The incision is easily closed and there is little or no danger of hernia (Mayo).

Israel's Incision.—

Israel exposes the kidney by an oblique incision, beginning at the junction of the erector spinæ with the twelfth rib, running forward and downward to a point two or three finger-breadths to the median side of the anterior superior spine of the ilium (Fig. 477). This direction has the advantage of exposing the upper segment of the ureter. If it is desirable to expose this further downward toward the bladder, the incision is lengthened from its lower end downward and forward parallel to Poupart's ligament. To palpate the ureter as far as its insertion into the blad-

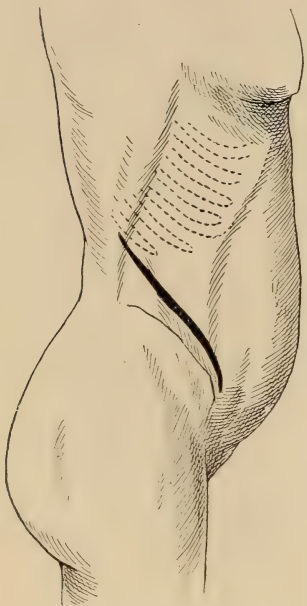


FIG. 477.—Israel's incision.



FIG. 478.—Robson's incision.

der, the incision may be lengthened to the outer border of the rectus, or to operate on the vesical section under good exposure the rectus may be incised. If this incision does not give sufficient room in difficult nephrectomies, Israel uses a second incision—a transverse, beginning two finger-breadths below the border of the ribs, and running anteriorly toward the rectus muscle at right angles. Israel's incision is especially applicable to nephrolithotomy and nephrectomy.

Robson's incision is suitable for nephrotomy and for nephrectomy. It has the advantage of exposing the kidney by splitting the muscles in their course, without dividing muscle-fibers or weakening the abdominal wall, and without wounding vessels or nerves. Robson's operative incision is begun to the inner side of the anterior-superior spine of the ilium, and is carried backward obliquely toward the tip of the last rib (Fig. 478). The fibers of the external oblique and its aponeurosis are separated and retracted, exposing the internal oblique muscle, the muscular fibers of which are split on a line between the ninth costal cartilage and the posterior-superior spine

of the ilium, in which position they are longer than in front of or behind that line. The fibers of the transversus are split and retracted along with the oblique muscle.

A diamond-shaped space is thus formed, at the bottom of which is seen the transverse fascia; this is incised, exposing the perirenal fat, and on pushing through the fat, the kidney is easily reached in whatever position it may lie. This incision gives plenty of room, and if needful, the whole hand can be introduced into the circumrenal space. If it becomes necessary to expose the ureter, the incision may be continued obliquely downward toward Pou-



FIG. 479.—Towelling the incision, one side completed.

part's ligament. The internal oblique will then require suture to bring the divided ends together. Preferably a second lower incision through the outer border of the rectus muscle may be made to reach the ureter (Robson).

DIRECTIONS REGARDING ALL INCISIONS

Whatever the site of the incision, it may be stated as a general rule that all incisions should be sufficiently long to expose the operative area freely. As a rule, the skin incision should be slightly longer than the incision through the fascia. After making the first stroke, which is carried just through the skin, the blade of the knife and the cut exposed edges of the skin may be wiped with

alcohol; the subcutaneous fat is then divided down to the underlying fascia. The fascia may now be cleared of fat on either side of the median line for about one-quarter of an inch, thus facilitating the subsequent overlapping



FIG. 480.—Towelling the incision, both sides completed.

and suture of the fascia. At this point towels should be clamped to the edges of the skin on either side of the wound (Figs. 479 and 480); this prevents contact with the skin throughout the subsequent steps of the opera-



FIG. 481.—Incision made; sides protected with gauze pads; self-retaining retractor in position; myoma uteri exposed.

tion. When the incision is cleared, the fascia is divided in the line of the skin incision and the underlying muscle exposed. In celiotomy incisions, as a rule, the muscle-fibers are not incised, but separated by blunt dissection down to the underlying preperitoneal fat (Fig. 481), or the neighboring

border of the muscle is separated from its attachments and the muscle is retracted to one side (Fig. 484). In certain areas this blunt dissection must be assisted by an occasional nick with the knife. When the preperitoneal fat is exposed, it is picked up between two forceps and incised (Fig. 483). The fingers are introduced into the wound, and the fat is stretched or torn

FIG. 482.

FIG. 483.

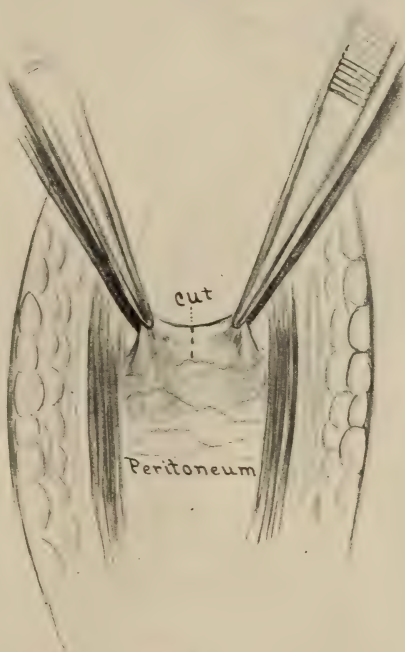
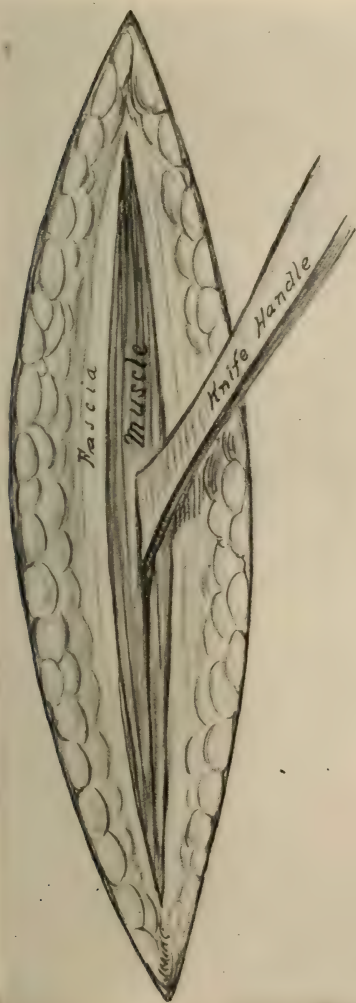


FIG. 482.—Separation of muscle fibers.

FIG. 483.—Opening the peritoneum.

so as freely to expose the peritoneum. This is caught lightly with tissue forceps on either side of the median line, the grasp being released and renewed once or twice on either side until it is certain that the forceps holds nothing but peritoneum, when a small nick is made between the forceps points. Air at once enters the opening, and the omentum and intestines fall

away from the incision. The peritoneal, and if need be the fascial and skin wounds, are now enlarged sufficiently to expose the operative area by cutting one after the other with heavy scissors or knife (Fig. 485), the intestines and omentum being protected by the first two fingers of the operator's left hand placed inside, with the palmar surfaces upward, along the line of the proposed incision. After the incision has been enlarged to a suitable degree, the edges should be protected with flat pads of wash-cloth material, which are held in position by means of retractors, or secured to the corresponding edges of the peritoneum with clamps. One of the advantages of the self-retaining retractor is that it holds these pads in a fixed position and prevents soiling of the subcutaneous fat, fascia, and muscle.

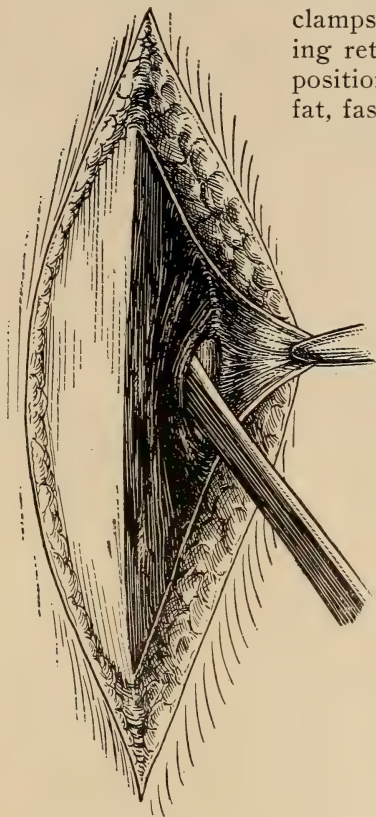


FIG. 484.—Separation of the rectus muscle from its lateral attachments along the linea alba.

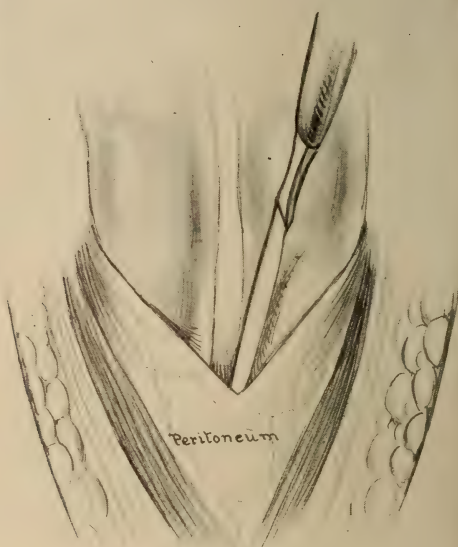


FIG. 485.—Lengthening the incision.

ISOLATION AND EXPOSURE OF THE OPERATIVE AREA

Isolation and exposure of the operative area are secured by suitable posture and the introduction of gauze sponges or pads. In pelvic operations the intestines are made to gravitate out of the pelvis by raising the pelvis and lowering the chest (Trendelenburg's position) (Fig. 487). In operations involving the upper abdomen the position is reversed, *i.e.*, the chest and upper abdomen are elevated, whereas the pelvis is lowered. In operations on the gall-bladder and bile-ducts the lower thorax is elevated by means of a sand-bag or an air-cushion, or by a special elevating platform attached to the table (Elliott's

position) (Fig. 488). This brings the parts nearer to the surface, and causes the stomach, transverse colon, omentum, and intestines to fall away from the operative area. It also facilitates rotation of the left lobe of the liver forward and upward out of the incision.

After the operative area has been freed of coils of intestine as far as possible by posture, the intestines and other adjacent viscera are gently held to one side and gauze wrung out of hot normal salt solution or hot sterile water is packed in one continuous strip about the area to be exposed, so as to keep the neighboring and encroaching viscera out of the way. This procedure has two objects: First, satisfactory exposure of the field of operation; and secondly, avoidance of contamination of the surrounding parts. Instead of the continuous gauze roll, large gauze pads to each of which a tape is attached may be used, the tape being always left outside the abdomen and secured with a hemostat.

Before the protective gauze pack is introduced the abdominal walls should be relaxed thoroughly, so that the intestines need not be pushed forcibly out of the way. Neglect to observe this precaution is believed to be one of the causes of adynamic ileus.

Before introducing the gauze pack it is often advisable and necessary to break up any adhesions that may have formed between the omentum and the abdominal parietes or the diseased structures in the operative area. The extent to which this separation is done before packing off is determined by the density of the adhesions and the probability of the release of pus or other infectious material.

In pelvic operations the omentum can usually be freed of its attachments to the pelvic viscera, so that the intestine may be rolled up above the pelvic brim and packed away. If, however, the adhesions are very extensive, or apparently cover and protect collections of pus, the omentum may be tied off at a free point above and divided; or if a portion of the small intestine itself is adherent and intimately associated with the focus of pelvic infection, it may be left undisturbed, the surrounding coils of gut being displaced upwards as far as possible or simply protected with folds of gauze.

In the case of suppurative appendicitis with tumor formation, the adhesions between the appendix and the neighboring intestine should never be disturbed until the adjoining areas have been thoroughly walled off.

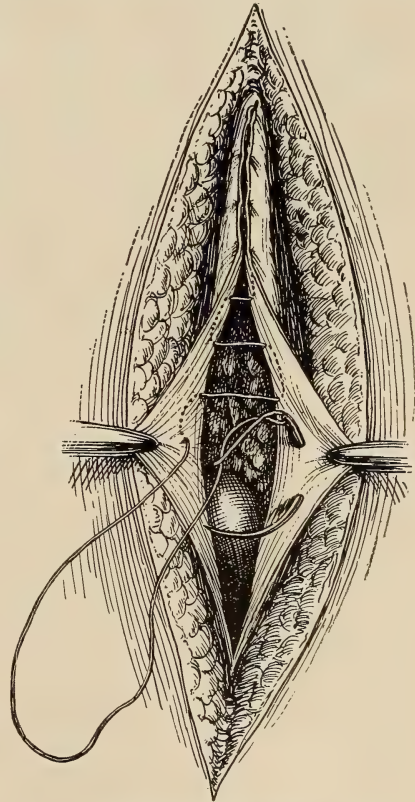


FIG. 486.—Eversion of peritoneum with closing suture; first method.

In gall-bladder and stomach operations the same precautions should be observed. The surrounding areas should be carefully protected, and the free coils of intestine held out of the way before any extensive or dense ad-

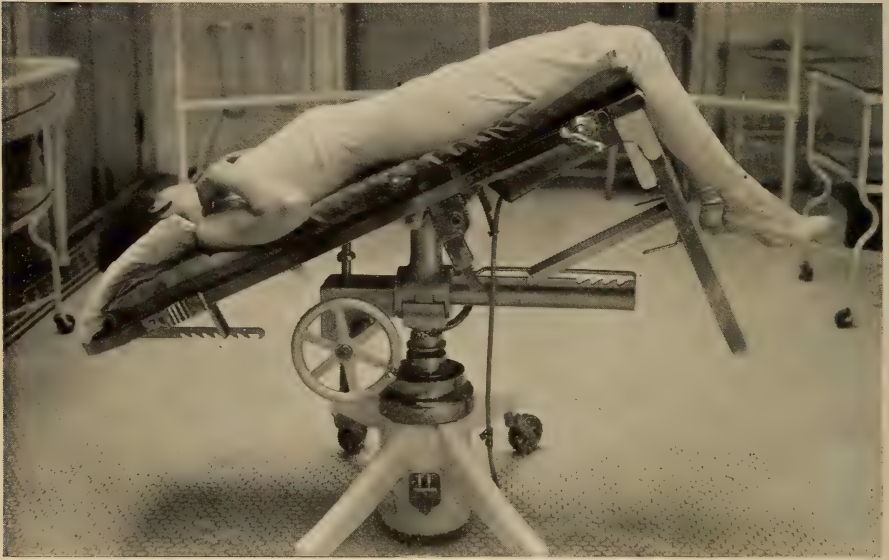


FIG. 487.—Trendelenburg (elevated pelvis) position.

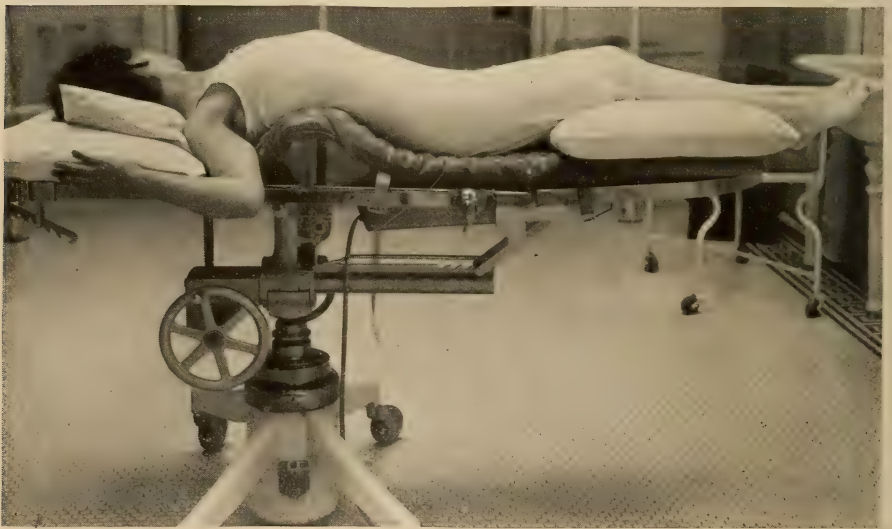


FIG. 488.—Elliott position (elevated thorax) for upper abdominal operations.

hesions are broken up. Gauze should be placed above the right kidney, in the case of gall-bladder operations particularly, in order to prevent the collection of fluid in the right kidney fossa.

In all cases of intestinal anastomosis or resection the involved coils of

intestine should be drawn outside the incision and gauze pads packed below and around the operative area, so that contaminating fluid will not find its way into the peritoneal cavity.

At the close of an operation, before the gauze pack is removed, the operative field should be thoroughly cleansed with sponges wrung out of salt solution. If drainage is to be employed, it should be put in place before the packs are disturbed. A careful record should be made of the gauze rolls or pads that were prepared for use during the operation, and the count made after the packs are removed should correspond absolutely to the one made before the operation. Only after they agree should the abdomen be closed.

EXPLORATION OF THE ABDOMEN

In a certain number of cases it is impossible to differentiate between neighboring and related lesions unless the abdomen is opened. If, therefore, every other means of differentiating between two intra-abdominal conditions have been exhausted, and if operation is plainly indicated in any case, an exploratory celiotomy should be advised. Every celiotomy is to a certain extent exploratory, for the details of diagnosis are brought out and confirmed, or a mistaken diagnosis is corrected. The more skilled the surgeon is in diagnosis, and the more complete his methods are, the less likelihood there will be of error.

It is advisable, as a matter of routine, to investigate, as far as practicable, the condition of some of the most frequently affected abdominal structures after the operation for which the abdomen was opened has been completed. This general exploration should never be carried out if the field invaded by the operation is the focus of septic infection. It is only in clean cases that general exploration is permissible, unless there are symptoms that clearly indicate a second lesion at a distance from the most urgent one, and the exploration should then be made as soon as the abdomen is opened. To be specific, in undertaking an operation for pelvic inflammatory disease, the appendix should be exposed at once, and if necessary removed, before the pelvis is invaded. If symptoms strongly suggestive of cholecystitis or duodenal ulcer are present, exploration of the upper abdomen should be made by the hand introduced through the pelvic incision before the pelvis is touched, but never afterward. Furthermore, after clean intrapelvic operations, when the patient is in good condition, it should be a routine practice to examine and inspect or palpate systematically the kidneys, gall-bladder, pylorus, appendix, lower ileum, and sigmoid. In this way lesions will be detected and may be treated that would otherwise escape observation and continue to render the patient uncomfortable and prevent the full restoration to health which she expects will follow operation. Among these may be mentioned chronic appendicitis, adherent appendix, displacements and enlargements of the kidney, adhesions that distort the lower ileum, cæcum mobile, gall-stones, redundant or kinked sigmoid flexure, and midline ptosis of the stomach and transverse colon.

HÆMOSTASIS

In the performance of pelvic operations hæmostasis is secured with ligation, clamping and torsion of individual vessels, and compression of bleeding surfaces with hot gauze packs. The bleeding vessels in the skin and subcutaneous fat that have been divided in making the incision should be caught with forceps. The instruments may be removed after the incision is completed, the vessel being twisted until the forceps is released. Vessels in the preperitoneal fat, especially the deep and the superior epigastric vessels, should be divided between two clamps, and both cut ends ligated at once. Hæmostasis in pelvic operations, whatever their nature, should be completed as the operation progresses; the blood supply may be secured with ligatures before division of the various structures is accomplished, or it may be left until the parts have been extirpated, the vessels being clamped temporarily. Some operators prefer one method, some another. By first clamping and then tying the vessels the operator is enabled to complete the extirpation of the diseased structures in a shorter period of time, but it is questionable whether this method is as safe as ligation in the course of the operation. It is good practice to ligate the larger vessels singly and in their course preparatory to excision. After excision has been completed, the larger trunks are secured a second time. If, during the course of a pelvic operation, a vessel is accidentally punctured with a needle, a ligature is placed upon its proximal side in order to avoid the slight risk of embolism which the wounding of a vessel necessarily entails. In removing the tube of one side without the ovary, care should be taken to preserve the ovarian circulation, as has been described under the head of Salpingectomy (page 437).

In performing hysterectomy and bilateral salpingectomy with conservation of one or both ovaries, the ligation of the ovarian branch to the tube must be done most carefully, for otherwise the ovarian supply itself may be interfered with. For this reason, if the tube is healthy, it may invariably be conserved with the corresponding ovary, the utero-ovarian ligament and the inner extremity of the mesosalpinx and tube being ligated without interfering with the intrinsic ovarian supply.

In perforating the broad ligament, as in the Webster-Baldy operation, a clear space should be selected carefully, but if a vein is accidentally torn, a clamp must at once be applied on both sides of the bleeding spot, and later ligatures that secure the injured vessel well to each side of the ruptured area. Hemorrhage from an incision or a needle prick in the uterine wall is best controlled by figure-of-eight or mattress sutures. Hemorrhage from a tear in the capsule of the ovary may be controlled by the passage of a fine suture completely through the ovary and back to the surface of entry, the suture being tied so as gently to compress but not to cut the ovarian stroma. Bleeding points on the floor of the pelvis from vascularized adhesions or vessels in the cellular tissue, rectal wall, broad ligament, etc., if of any consequence, should be picked up individually with forceps and tied with fine catgut, or mattress or circular sutures of fine gut may be used. A gauze pack wrung out of very hot water and firmly applied for a few minutes will usually suffice to check the capillary oozing. If the operator is absolutely certain that the

main vessels are properly secured, slight venous or capillary oozing may be disregarded so far as danger to life is concerned, but from the viewpoint of speedy and normal *restitutio ad integrum* of the tissues even this should, so far as possible, be checked. If the oozing is so marked as to make the formation of a hæmatocele probable, and if it cannot be controlled by ligation or pressure, particularly if the operator is pressed for time, a gauze pack surrounded with rubber may be used. If time allows, a little patience and painstaking effort will in most cases be successful.

ADHESIONS

Adhesions may be found between any of the intrapelvic or abdominal viscera. They vary in degree from the simple attachment of a tag of omentum to an inflamed ovary or tube to the most widespread coalescence of intestines, omentum, pelvic viscera, and parietal peritoneum. Adhesions between the omentum and the parietal peritoneum of the anterior abdominal wall may usually be detected on making the peritoneal incision. As the peritoneum is picked up with forceps preparatory to the incision, it feels thicker and more fixed than normal. Under such circumstances it is desirable to open the peritoneum at a higher point, so that an exact orientation may be made of the parts involved. For example, if the adherent structure is the gastro-colic omentum, it would be well, under certain circumstances, to refrain from separating the adhesions, lest damage to the omentum would necessitate resection of a portion of the transverse colon.

The first consideration, therefore, is to identify the areas involved. The separation of adhesions is usually readily effected by making gentle pressure with the gloved finger or the finger wrapped in moist gauze, supplemented by the immediate ligation of bleeding points. If the adhesions are dense, it is better to cut than to tear them. For this purpose a very sharp knife is used, and the line of division is determined by making traction on either side of the line of adhesion. In bad cases blunt dissection is more likely to cause visceral injury. If the adhesions are exceedingly vascular, clamps or ligatures should be applied and division made between them. No matter how complex and hopeless the separation of adhesions seems at first sight, patience and gentle persistence will usually overcome them. If the adhesions are very extensive, it is at times unwise to separate every attachment. If the small intestines are markedly adherent to each other, no attempt should be made to free them all, since if this is done a recurrence is most likely to take place. In such cases the separation should be reserved for such adherent coils as are kinked or obstructed, and such as conceal or render inaccessible other organs that the operator desires to expose. In separating the uterus or adnexa from the rectum, sigmoid, or small intestines, thorough exposure to view, as well as to palpation, will avoid troublesome and dangerous tears of the hollow viscera. The fingers should hug the uterus or adnexa closely, and the lines of natural cleavage and of less resistance should be sought, while the occasional use of the knife or scissors will open up planes of tissue and serve to prevent laceration of important viscera. At times, when it is evident that the separation of adhesions between the pelvic viscera or growths and the intestines will almost certainly

be attended by injury, the capsule or outer coat of the adherent viscus or tumor may be shelled off and left attached to the bowel; the raw surface should be whipped over, or flaps may be made and approximated by sutures in such a way as to prevent compression or constriction of the bowel. In some cases, especially in those in which an ovarian or tubal abscess has previously been connected with the bowel by means of a fistulous opening, it will be impossible to free the adhesions without tearing the bowel. When the two limbs of a coil of intestine lie parallel and are intimately adherent, forming a partial obstruction, and there is great danger, from separating the adhesions, of inflicting serious injury that will require resection of bowel and anastomosis, a simple enteroenterostomy with clamps between the two coils will be the most advantageous procedure.

WOUNDS OF THE VISCERA

Whenever the bladder, intestine, or ureters are torn during the separation of adhesions or in the course of an operation the injury should be repaired at once. When the bowel is the seat of injury this usually is accomplished by the passage of two rows of continuous or interrupted linen or celloidin thread sutures, closing the opening and bringing healthy serous surfaces together, transversely to the axis of the gut. If the laceration is extensive, or if the blood supply is so greatly impaired by injury to the mesentery that the gut would be likely to become gangrenous, resection of the affected area, with end-to-end or lateral anastomosis, must be practised. The latter is usually to be preferred. When speed is a matter of importance, the Murphy button is valuable.

When the rectum is injured low in the pelvis, with loss of tissue, and if the site of injury is such as to render excision and anastomosis exceedingly difficult, if the uterus is available, its posterior surface may be sutured into the rectal opening, its serous covering temporarily forming a part of the anterior rectal wall. If the uterus has been or must be removed, the stump of the cervix may be used, or the posterior vaginal wall, the bladder, or a flap of peritoneum.

After repairing an injury to the rectum a test of the completeness of the closure should be made by injecting salt solution into the bowel.

The ureters and the bladder may be injured during the separation of adhesions, but they are more often wounded during the course of an operation requiring separation of the bladder from the neighboring uterus or the anterior vaginal wall. Supravaginal hysterectomy for a fibroid tumor that has displaced or distorted the bladder and the extensive panhysterectomy for cancer of the cervix especially predispose to such an accident. The wound is usually above the trigonum, and may readily be closed by an inner row of catgut and an outer row of linen or celloidin thread sutures. If the injury involves the trigone, the ureters must be orientated accurately before the sutures are passed.

If the ureter itself is merely cut without being completely divided, and the structure is not bruised or lacerated, immediate repair may be effected by introducing interrupted sutures of fine catgut passed through the outer coats and coaptating the cut surfaces. If the ureter is completely divided,

or if it is bruised or lacerated as well as cut, several plans are available. If the injury is near the bladder, the proximal end of the ureter should be implanted into the bladder, or the proximal end may be implanted into the distal end. If neither of these plans appears feasible, an anastomosis may be made between the ureter and the rectum. When the ureteral anastomosis threatens to be difficult, and rapid completion of the operation is desirable, if the kidney on the uninjured side is sound, the cut ureter should be doubly ligated and dropped. This causes pain for a few hours or days, but the kidney on the ligated side soon ceases to function and may give no further trouble; should it do so, the organ may be removed later by nephrectomy. After all forms of ureteral anastomosis the anastomotic area should be covered or enveloped with peritoneum or a pad of fat or omentum. The technic of these operations is considered on pages 492-493.

Ligation of the Ureters.—See Post-operative Complications, Chapter XXXVII).

TREATMENT OF DENUDED SURFACES

The treatment of surfaces denuded as the result of the separation of adhesions is a difficult but most important problem in order to avoid their post-operative recurrence. As a rule, after every salpingectomy, salpingo-oophorectomy, or hysterectomy the raw surfaces may be covered by properly disposing the peritoneal reflection of the bladder or the peritoneal surfaces of the broad and round ligaments. The anterior wall of the rectum, the sigmoid flexure, and the omentum—all may be so disposed by sutures as to assist in covering raw surfaces, and thus lessening the liability to the formation of adhesions. A study of the technic of the various operations in pelvic surgery will show this peritonealization to be the final step in all.

It would be extremely fortunate if a material were discovered that could be spread over raw surfaces and so prevent the formation of adhesions. Up to the present no satisfactory substance has been found. The most promising of those recommended have been cargile membrane (the dried serous membrane of the ox) and various oily preparations. None of these has a constant or a positive value.

Some raw surfaces may be covered up by bringing one-half of the surface in contact with the other half or by attaching the entire surface to a neighboring structure, taking care that no small pockets or openings are formed that would predispose to strangulation of the intestine. Raw areas on the intestine or mesentery may be covered with omentum or attached to the parietal peritoneum, provided the intestine is in such a position that it can functionate normally and no small openings or pockets are formed in which a knuckle of gut might be caught.

A raw edge of omentum should be rolled up into the healthy surface of the omentum and secured by sutures. After extensive separation of adhesions and the exposure of considerable raw surface on the posterior aspect of the broad ligament, if hysterectomy is to be done, the anterior peritoneal surface of the broad ligament and bladder should be conserved as far as possible, so that there will be sufficient loose peritoneum to draw over the floor of the pelvis and the posterior surface of the base of

the broad ligament. Occasionally all that one can do is to wash the raw surfaces thoroughly with salt solution and move the bowels shortly after operation in the hope that, by exciting active peristalsis, the formation of new adhesions may be prevented.

CLOSING THE INCISION

The *peritoneum* is closed with a running suture of fine gut, so placed as to evert the edges of the peritoneum (Figs. 486 and 489). This is done in an endeavor to avoid the formation of adhesions between the inner surface of the incision and the abdominal viscera. It is very important; otherwise adhesions will form in a large proportion of cases.

Muscle sutures may be omitted in closing incisions involving the rectus muscle,

for if the fascia is overlapped, the separated fibers of the muscle will lie in apposition and hence a suture is unnecessary. If the operator prefers, he may unite the muscle borders with a running suture of fine catgut or a few fine interrupted sutures. In muscle-splitting incisions, notably the McBurney incision for removal of the appendix, the borders of the split muscle may be approximated by one or two sutures. If a muscle is cut across its fibers, one must reunite the cut ends. These are approximated with fine gut while splint sutures of the mattress type are placed at some distance from the cut edges.

The *fascial suture* is the most important. The general principle in suturing the fascia is that of overlapping. In the ordinary right rectus incision the superior surface of the fascia on the left side of the incision is cleared of fat, whereas the under surface of the fascia on the opposite side is freed from the underlying muscle. Sutures are now introduced so as to unite the superior surface of the fascia on one side to the under

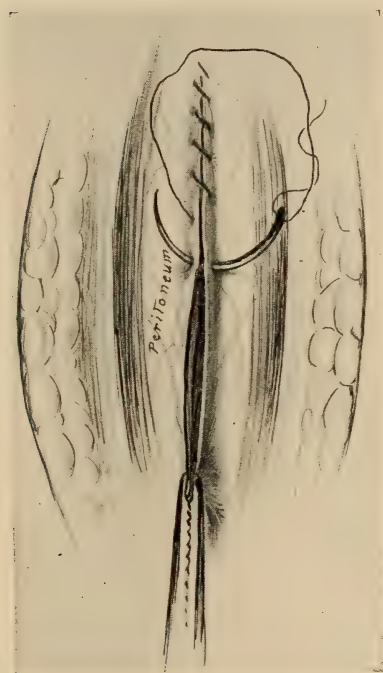


FIG. 489.—Eversion of peritoneum; closing suture; second method.

surface of the fascia on the other side. This may be done by interrupted or continuous sutures, as the operator prefers (Fig. 490). A combination of interrupted sutures at one-inch intervals and a continuous suture for the entire length will prove very satisfactory.

The fat layer may be disregarded except when it is abnormally thick; it then should be drawn together with interrupted through-and-through sutures of silkworm gut.

The skin suture should be of fine catgut. It may be used as a subcuticular or as a buttonhole stitch (Fig. 490); the latter is the easier to introduce, and gives an equally good approximation; it permits better drainage of the subcutaneous fat, but leaves a more unsightly early scar. Later

the line of incision is less likely to undergo hypertrophy or to stretch than after the subcuticular stitch.

Mass suture or through-and-through suture of the incision may be used when rapidity of closure is the first requisite. The needle is passed through the skin, subcutaneous fat, fascia, muscle, and peritoneum. It is introduced

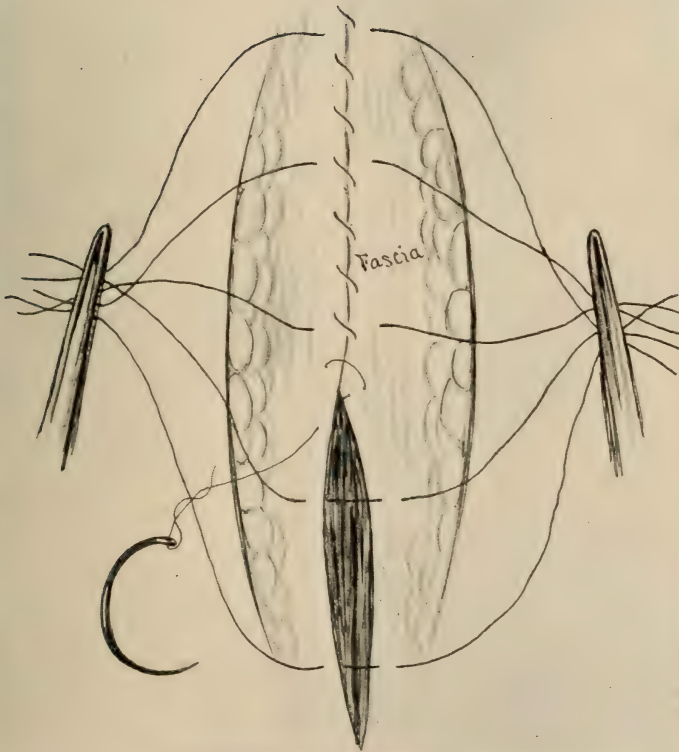


FIG. 490.—Closing fascia, showing detail of suture for overlapping.

about a quarter of an inch from the edge of the skin incision, passed with a full sweep outward through the fat, fascia, and muscle, and made to emerge on the under surface of the abdominal wall one-eighth inch from the edge of the peritoneum; the suture is then continued in an opposite direction through the other side. A closure of this sort, in a majority of cases, secures good approximation of the borders of the wound; the point where the stitch is

exposed upon the under peritoneal surface is sealed over in the course of a few hours, so that there is little risk of adhesions. Nevertheless, except in the most hazardous cases, when every minute counts, through-and-through mass sutures are inadvisable. In very stout individuals, or when drainage is used, or if, for any other reason, it appears desirable to make the

incision particularly secure, the combination of splint sutures, embracing all the layers of the abdominal wall except the peritoneum, should be used with a continuous suture of the peritoneum and fascia. The splint sutures are placed after closure of the peritoneum, an inch or more apart, and held with hemostats to either side of the incision; a continuous suture of the fascia is then introduced, after which the splint sutures are tied. If necessary, additional interrupted skin sutures may be introduced. When drainage is used in the incision, whatever the form of suture selected, two through-and-through sutures, taking in all the coats of the abdominal wall, including the peritoneum, should be placed one just above and one just below the drain. If the drain is put for the purpose of controlling hemorrhage and is to be removed during the course of twenty-four hours, another suture may be inserted, but not tied at the site of the drain; this may be tied after the drain is taken out, completing the closure.

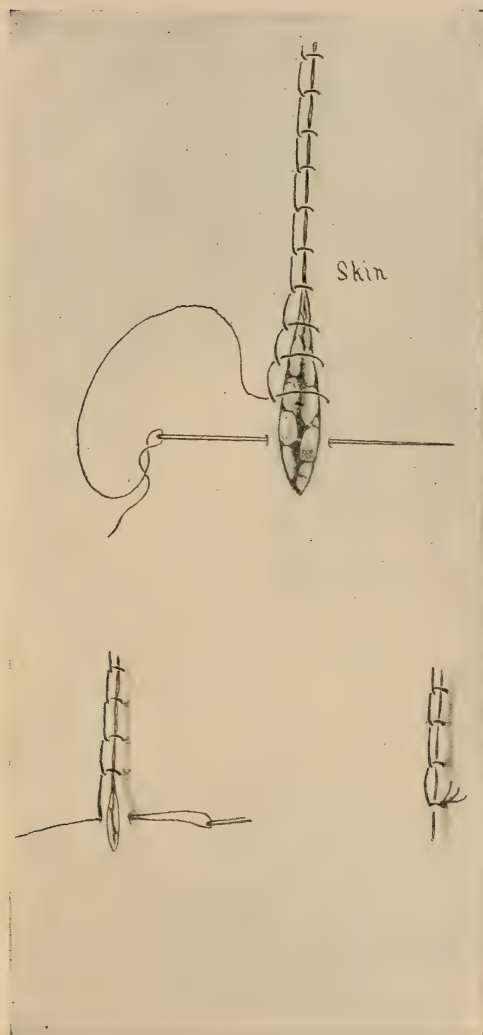


FIG. 491.—Finish of buttonhole stitch.

DRESSING THE INCISION

After the skin suture is completed, the line of incision should be carefully dried, touched with a 5 per cent. solution of iodine, and several

thicknesses of dry folded gauze applied, the surrounding skin areas having first been carefully cleansed. The dressing should be held in place by broad strips of perforated adhesive plaster, running from flank to flank, and covering the entire abdominal surface from above the upper limits of the dressing to the symphysis pubis. If the plaster is applied snugly, no other support is needed. To prevent it from becoming loose in the groins a perineal pad of sterile gauze (this is usually required)

and a "T" bandage should be applied. A plan which Clark has recently used with success is illustrated in Fig. 493; this facilitates examination and dressing of the wound with a minimum amount of discomfort to the patient. When drainage has been employed, the end of the drain is transfixed with a safety-pin about a quarter of an inch from the skin surface, and a layer of gauze wrung out of 1:4000 bichloride solution is interposed, a straight cut being made in the gauze so as to facilitate this arrangement. Additional folds of moist bichloride gauze are now put over the end of the drain, and over these dry gauze and a layer of cotton. These dressings may be anchored in place by a few strips of adhesive plaster, and the abdo-



FIG. 492.—Suprapubic pelvic drain.

men should be enveloped in a Scultetus bandage for the first few days. The dressings are changed or reinforced as soon as they become soiled; usually a daily dressing is sufficient. Later, especially when frequent dressing is required, side straps of adhesive plaster with tapes attached, which can be tied over the dressings, are most satisfactory. The ordinary clean incision that gives no evidence of faulty union, severe pain, rise of temperature, etc., need not be dressed for ten days after the operation. At that time the gauze and plaster should be removed, the skin cleansed with alcohol, and a fresh dressing applied. When the incision has been a large one, when drainage has been employed, and when the abdominal wall is heavy and relaxed or very fat, it is advisable for the patient to wear a binder for several months.

For small incisions that have healed per primam, in young individuals with good muscular development, a special binder is not important, since the ordinary corset answers all the necessary requirements.

SPONGES AND PADS USED IN ABDOMINAL SURGERY

In abdominal and pelvic surgery sponges and pads are used for three purposes: (1) To remove blood (sponging) and detritus from the field of operation; (2) to pack off the intestines from the general peritoneal cavity; and (3) to protect the edges of the incision. For the first purpose marine sponges would be preferable if their physical properties alone were considered, but because of the difficulty in sterilizing them and the fact that they are expensive, their use has been generally abandoned. Nevertheless, they are still occasionally seen

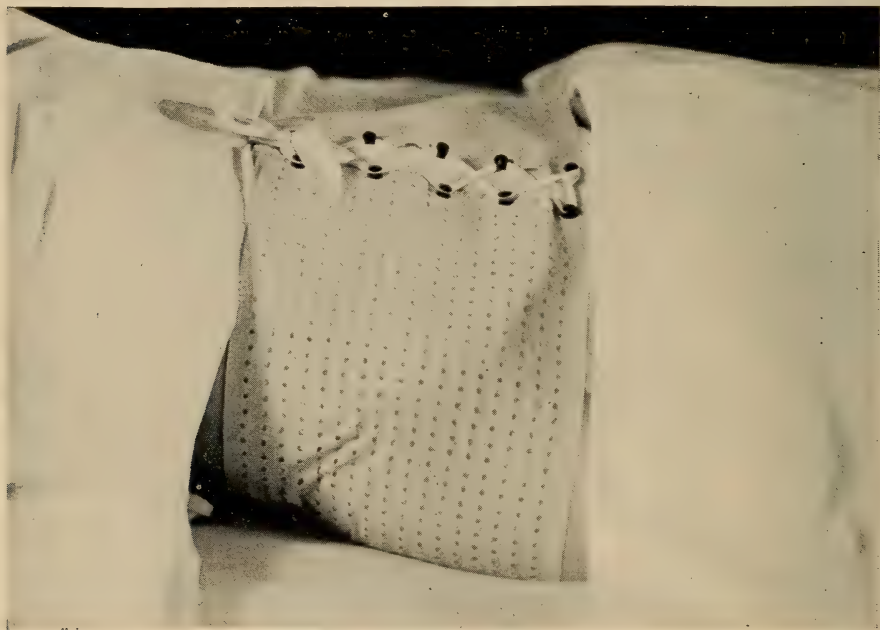


FIG. 493.—Abdominal dressing applied.

in operating rooms, and for ordinary sponging they are much superior to gauze pads. Gauze sponges are made of folded squares of gauze, the rough and selvedge edges being turned in, and sometimes additionally secured by stitching. Several sizes are usually available, and to the larger ones tapes may be attached so that when they are placed within the pelvic or abdominal cavity for walling-off purposes the tapes are left hanging outside and secured with hemostats. Gauze in the form of pads or sponges, however, should be used only exceptionally for this purpose. The routine packing-off and extraperitonealization should be done with a roll of gauze with edges folded in, the dimensions of the roll for the usual intrapelvic work being 1 by 3 feet. For appendix, gall-bladder, and kidney operations a roll six inches in width may be preferred. If one roll is not sufficient, a second or a third may be used, the end of each strip being left to project from a suitable

part of the incision and being caught with a hemostat. Gauze pads or sponges should be packed in bundles of a fixed number and a single variety; rolls of gauze should be wrapped separately in muslin covers; the number of gauze pads, sponges, and rolls used should be carefully recorded. When rolls of gauze are employed for packing-off no pads should be placed inside the abdomen, except under unusual and urgent circumstances. All gauze sponges, pads, or rolls used during an abdominal operation, either internally or externally, should be counted and recorded before the operation is begun and after it is completed; the two counts must agree before the incision is closed. All gauze used within the peritoneal cavity should be moist, *i.e.*, it should have been wrung out of hot sterile water or hot normal salt solution. By this means irritation of the peritoneal surface is reduced to a minimum.

ANÆSTHESIA

One of the most important details in connection with an operation is that of rendering the patient insensible to the procedure, with a minimum of shock to the nervous system and the least possible depression of the vital functions.

Anæsthesia is produced in various ways; the most customary method is by the inhalation of nitrous oxide, oxygen, and ether. Ether and chloroform have been very popular in the past, ether being generally preferred because of the fact that it is less dangerous, but chloroform has, nevertheless, many advocates. During recent years nitrous oxide has been very generally employed previous to the ether, narcosis being induced by the nitrous oxide and continued with the ether. At present nitrous oxide and oxygen are employed extensively for operations of short duration; for prolonged operations nitrous oxide, oxygen, and ether constitute the most efficacious and the safest combination.

Ether.—For routine administration ether is the safest of all anæsthetics. It has, however, certain disadvantages and dangers. The after-effects of ether consist of nausea, vomiting, and extreme thirst. Its use may light up an old tuberculous lesion; it may produce pneumonia or nephritis, or may aggravate an old renal condition. In fat, thick-necked people and in asthmatics, it may be impossible to administer ether without causing strangulation. By reason of its effect on the body heat or on the excretory functions, serious shock or profound toxæmias may be increased by the use of ether. Nevertheless, for the average surgical case, when carefully and properly administered, preceded or not by nitrous oxide, it is the least harmful and the most satisfactory of all anæsthetics.

Chloroform.—Chloroform is more rapid in its action than ether, and the anæsthetization is effected with less struggling and less general disturbance. It is not so irritating to the mucous membranes of the respiratory tract, and probably irritates the excretory cells of the kidney less than ether does. Chloroform is much more dangerous, however, since it is depressing to the circulation; it may, with very little or no warning, cause cardiac arrest and death; in a small proportion of cases also, when anæsthesia is prolonged, it may cause acute yellow atrophy of the liver. Its disadvantages appear, therefore, to exceed its advantages, and for major pelvic or gynecologic operations chloroform anæsthesia has fallen into disfavor.

Nitrous Oxide and Oxygen.—The administration of nitrous oxide, when combined with oxygen, may be continued almost indefinitely. This has become a favorite method of anæsthesia for brief operations. Pelvic operations, in which perfect relaxation of the abdominal wall is required, are not adapted to the use of nitrous-oxide-oxygen anæsthesia, but in abdominal operations in which absolute relaxation is not required this form of anæsthesia may be employed with satisfaction. The anæsthesia should be preceded for a half hour or so by the exhibition of morphine (gr. $\frac{1}{6}$) and atropin (gr. $\frac{1}{150}$). This helps to quiet the patient and promotes muscular relaxation. The nitrous oxide and oxygen are administered by means of a special apparatus that permits a mixture of any relative proportion desired. Nitrous oxide has the disadvantage of raising the blood-pressure, so that in patients with high blood-pressure or cardiac disease it is contraindicated or must be used with extreme caution, and with a large admixture of oxygen.

Nitrous Oxide, Oxygen, and Ether.—By combining nitrous oxide, oxygen, and ether an anæsthesia may be effected that will meet nearly all requirements. The anæsthesia may be quickly induced with the nitrous oxide, continued in combination with oxygen for brief operations, when deep intra-abdominal or pelvic work is not being done, or supplemented with ether when the operation is of longer duration or demands more complete relaxation.

Anæsthesia by Combined General and Local Methods.—Crile believes that when an operation is performed under general anæsthesia continual shocks are sustained by the central nervous system from the impressions of trauma that are conveyed there by the sensory nerves in the operative region. These subconscious impressions, he asserts, are largely responsible for what is known as surgical shock. He seeks to eliminate these impressions by his method of "Anoci Association" (see Chapter XXXV, page 617).

Ethyl Chloride.—Ethyl chloride by inhalation is suitable only for very brief anæsthesia. It is not generally applicable to gynecologic operations, although it may be used for minor surgical procedures, as, for example, the incision of a vulvovaginal abscess. When used longer than momentarily, it becomes a dangerous and harmful anæsthetic, since it produces at times a spasm of the respiratory muscles.

Local Anæsthesia.—Local anæsthesia is the method of producing analgesia by the application of an anæsthetic solution either directly to a body surface or by injecting it into the underlying substance. The range of usefulness of local analgesia in gynecologic and pelvic surgery is generally limited to minor operations upon the external genitalia, as, *e.g.*, the removal of a urethral caruncle, and to celiotomies in which little more than an abdominal incision need be made, as when the operation is performed for non-adherent ovarian cyst, localized collection of pus, and the like. The field of usefulness of local anæsthesia may, by painstaking technic and patience, be extended to herniotomy and anterior vaginal hysterotomy, but in the absence of distinct contraindication to general anæsthesia, its use is not to be recommended.

Solutions for Producing Local Anæsthesia—Eucaine, Cocaine.—Local anæsthesia of the bladder and urethra may be induced by the injection,

into the bladder, of a 4 per cent. solution of eucaïne or cocaine. The solution should be applied directly to the trigone through a Kelly cystoscope, or injected by means of a catheter or a syringe with a long curved beak. A few drops also may be instilled into the urethra as the instrument is withdrawn. Local anæsthesia of this type may occasionally be required in making cystoscopic examinations, particularly in performing catheterization of the ureters in highly nervous and neurotic individuals or in those with exceedingly painful affections of the urethra or bladder. Anæsthetization of the external urinary meatus is effected by application, directly to the mucosa, of a pledget of cotton wet with a 10 per cent. solution of cocaine. Cocaine is the most effectual local anæsthetic. When the anæsthetic solution is to be injected, novocaine is much to be preferred to cocaine. Novocaine in a $\frac{1}{4}$ of a 1 per cent. solution, combined with suprarenal extract, is comparatively without danger, and may be used freely. The tissues must be infiltrated with the solution. Novocaine may be sterilized without undergoing decomposition.

Quinine hydrobromide and urea may be used in a $\frac{1}{6}$ to $\frac{1}{2}$ of a 1 per cent. solution in conjunction with local novocaine anæsthesia, as in the method of anoci association of Crile, or in certain operations in conjunction with general anæsthesia. Its use must be accompanied by massive infiltration of the tissues *at a distance* from the seat of operation. Its anæsthetic effect does not begin immediately, but usually within fifteen minutes, and continues for from thirty-six to forty-eight hours. It is, therefore, most useful in operations associated with marked post-operative pain, as, *e.g.*, perineal and anal operations.

Technic of Producing Local Anæsthesia by the Injection of Novocaine—Celiotomy Incision.—With a fine needle a drop or two of the solution should be injected *into* the substance of the skin (intracutaneously), not beneath it, in the projected line of incision. Into the periphery of the little welt thus raised another injection should be made, and still another, until the entire length of the contemplated incision has been treated. Division of the skin and subcutaneous fat is now painless; the fascia and the peritoneum must be infiltrated in the same manner as the skin. A razor-edged knife should be used, and the incisions should be confined strictly to the infiltrated area. After the peritoneal cavity is opened the abdominal wall may be infiltrated with quinine and urea ($\frac{1}{6}$ per cent. solution) at a point about an inch from the incision.

Vulvar or Vaginal Incisions.—The same procedure is followed as in the case of celiotomy incisions. The solution is injected into the substance of the skin or the mucosa. After dividing the anæsthetized skin, if the exposed subcutaneous tissues are sensitive, they must be infiltrated in turn. In vaginal, as in abdominal celiotomy, the peritoneum must be dealt with separately. After perineal operations infiltration of the tissues with quinine and urea ($\frac{1}{6}$ per cent. solution) may be made at the periphery of the operative area and about an inch from it.

Cervix Operation or Hysterotomy.—The cervix may be anæsthetized for performing dilatation by injecting a novocaine solution into its substance at numerous points in the periphery of the canal. In anterior hys-

terotomy a line of infiltration on the anterior lip is begun at its lower margin, and continued to the reflection of the vaginal mucosa. A transverse line of infiltration is now made, and the anterior vaginal attachment is divided. The bladder is next pushed up, exposing the anterior surface of the cervix and the lower uterine segment; the anterior wall of the uterus is then infiltrated, and the anterior hysterotomy incision is made.

Local Anæsthesia by Freezing with Ethyl Chloride.—Local anæsthesia by freezing with ethyl chloride may be used for such minor operations as opening a vulvovaginal abscess or removing venereal warts. The tube should be held from 12 to 18 inches from the area to be frozen, and the spray run up and down the line of the proposed incision until the area becomes white. Evaporation will be increased by fanning the area. Deep freezing is inadvisable for fear of causing sloughing of the tissue.

Spinal Anæsthesia in Pelvic Surgery.—The administration of a general anæsthetic may be undesirable or dangerous in: (1) Cardiac, pulmonary, or renal lesions of such a nature that general anæsthesia will embarrass or injure the circulatory, respiratory, or urinary symptoms. (2) Toxic states in which the excretory organs have already been taxed to their utmost, and in which the addition of another poison will mean excretory insufficiency.

When operation is imperative, or is highly desirable in patients who are unfavorable subjects for general anæsthesia, we turn naturally to local anæsthesia—*i.e.*, the concentration and limitation of the anæsthetic substance, whatever it may be, to the operative area, so that analgesia is produced, without any general influence being induced.

Without going into a discussion of local anæsthesia, it may be said in a general way that for pelvic operations in which full relaxation of the abdominal wall is required, infiltration of the operative area with anæsthetic solutions is unsatisfactory. This leads us more or less logically to spinal anæsthesia, which is really a form of local anæsthesia; by this method, however, the anæsthetic selected is applied directly to the root of the nerves, instead of to their peripheral branches. It would seem, *a priori*, that a much smaller quantity of any drug would be required if the anæsthesia were localized at such a point, and that the effects would be more strongly marked.

In a successful case of spinal anæsthesia, the anæsthetic drug becomes mixed with the spinal fluid, bathing the motor and sensory roots of the cord at and below an elected point, inducing motor and sensory paralysis of the areas supplied by those nerve-roots; in other words, an inhibition of pain in the operative area and full muscular relaxation.

The patient is prepared for the injection of the anæsthetic by a dose of morphine (gr. $\frac{1}{6}$) and scopolamine (gr. $\frac{1}{150}$). Usually one dose is sufficient, but if the patient is extremely nervous, the dose may be repeated. In some cases bromide or veronal the evening before operation will be advisable. If the preliminary injections are given at least an hour before the time set for operation; if the patient's ears are lightly plugged with cotton; if a bandage is placed over the eyes, and she is kept in a quiet room, she is usually in a drowsy condition or is actually asleep when the time for operation arrives.

The after-condition of the patient usually is ideal. A majority complain of no discomfort whatever. As a rule, there is no nausea. Occasionally a patient will complain of headache, but it is scarcely ever of sufficient severity or duration to become a serious matter. The post-operative suffering is less than after the use of ether or chloroform, and probably a trifle more than after nitrous oxide anæsthesia.

The best technic is that elaborated by Babcock. The solution employed consists of stovain (0.08 gm.), to which is added a small amount of lactic acid (0.04 c.c.) for the purpose of holding the drug in suspension in the alkaline spinal fluid, and a small quantity of alcohol (0.2 c.c.; water, 1.8 c.c.), to make the solution of lower specific gravity than the spinal fluid, which is constantly between 1.00055 and 1.00065. Another solution of a specific gravity greater than that of the spinal fluid is composed of stovain (0.08 gm.), lactic acid (0.04 c.c.), milk-sugar (0.10 gm.), and water (2 c.c.).

The first and lighter solution rises in the spinal fluid; the second is heavier, and sinks, so that extension of the analgesia above the point of injection, or limitation to the areas below, may be secured by selecting the appropriate solution and by elevating the head or the pelvis of the patient.

The spinal cord ends at about the level of the disk, between the first and second lumbar vertebræ; below this is the cauda equina. The second lumbar interspace is a favorite site for injecting the spinal anæsthetic when it is desirable to secure a loss of pain sense in the perineum, external genitalia, and lower abdominal wall. If the upper abdomen is to be invaded or the incision is to reach as far as the umbilicus, the injection must be made in the first lumbar interspace. The technic is as follows:

The patient is seated upon the side of the operating table with the legs hanging over; the arms are folded over the lower abdomen; the head is bent forward, and the back is arched. The skin surface is disinfected by the application of iodine and alcohol. The fourth lumbar interspace is located by so placing a towel that its edge runs across the line of the posterior iliac crests. This marks the fourth lumbar spine or the fourth lumbar interspace. The second or the first lumbar interspace is now located, and the skin is marked at the lower border of the spinous process above it. After the mark has been made, the patient must be warned not to move. The needle is next thrust through the skin, about 2 mm. to one side of the median line, and then pushed toward the spinal canal, being held perpendicularly to the surface. It is carried forward until the resistance of the ligamentum subflavum is felt, when the mandrin is withdrawn. As soon as the resistance of the ligament is overcome, the needle is pushed cautiously onward, a few millimeters at a time, until the slight resistance of the dura is felt. Puncture is often accompanied by a palpable snap, after which spinal fluid drops from the needle. The needle is carefully rotated, to make sure that the bevelled point is entirely through the membrane. The syringe, filled with the anæsthetic solution, is attached to the needle, and about 1 c.c. of the spinal fluid is drawn into the barrel. The mixture of spinal fluid and stovain solution is now steadily and somewhat rapidly injected, the needle is quickly withdrawn, and the patient is immediately placed in the recumbent posture, with the head slightly raised. Analgesia is usually complete

by the time the operative area is prepared, which generally consumes from three to five minutes.

If celiotomy is to be performed, the injection must be made in the first lumbar interspace. Injections in the second lumbar interspace occasionally produced analgesia as high as the umbilicus, but this is the exception, rather than the rule.

The dose of the stovain solution is determined by the age and weight of the patient. The determination of the dose of stovain is one of the difficult problems connected with spinal anæsthesia. Even though the anæsthetic solution is composed after a set formula, its strength varies, either because the chemical composition of the drug itself varies, or because its activity has been modified by sterilization. In a clinic where spinal anæsthesia is used constantly each new lot of anæsthetic ampoules must be tested in order to determine the maximum and the minimum dose. The ampoules as prepared for use contain 8 cgm. of stovain. The largest amount used in a series of gynecological operations was 6 cgm., but in most cases it was 4.5 and 5, or 5.5 cgm.

No preliminary dose of morphine and scopolamine is given in the young. In those over thirty the average dose of morphine is $1/6$ grain, and of scopolamine $1/150$ grain. In some patients this has no appreciable effect, and the dose of one or both drugs may be repeated. This is determined by the condition of the patient (pulse, respiratory tract, pupils, etc.), and whether she is drowsy and inclined to sleep, or is wide-awake and nervous. It is an important part of spinal anæsthesia, therefore, to determine just how much morphine, scopolamine, and stovain are needed, for if too small a dose is given, anæsthesia will fail, and if too large a dose is administered the patient will be placed in great danger.

Emphasis must be laid upon the necessity of immediately lowering the patient from the sitting position as soon as the injection is given. This, as is commonly the case, obtains particularly when a solution of lower specific gravity than the spinal fluid is used. If, under such circumstances, the patient is allowed to sit up, or if she is permitted to lie down with the shoulders and head higher than the pelvis, the anæsthetic solution will rise in the spinal canal and influence the higher nerve-roots. It should be remembered that in cleansing the syringe and the needle, alcohol should not be used, for it tends to diminish the specific gravity of the injection, and may lead to a rapid diffusion upward of the anæsthetic solution.

Deaths on the operating table from spinal anæsthesia occur more frequently than in ether, chloroform, or nitrous oxide anæsthesia. Spinal anæsthesia is especially dangerous in patients with low pulse pressure. Not only the record of these accidents, but also the care that must be taken to guard against them, bears evidence of the dangers attending this method, and how constantly those who use it must be on their guard.

Sudden death also occurs, but not so frequently, during the course of general inhalation narcosis. The greater risk in spinal anæsthesia is readily understood. If a patient under inhalation anæsthesia shows toxic symptoms, the anæsthetic can be withdrawn, whereas under spinal anæsthesia if toxic symptoms appear, all that we can do is to tide the patient over until the effect of the anæsthetic has worn off.

Nevertheless, in contrasting the mortality of spinal anæsthesia with that of ether and chloroform, one must not lose sight of the fact that post-operative morbidity and the number of deaths from pneumonia, kidney insufficiency, etc., are greater after ether or chloroform anæsthesia than after spinal anæsthesia. Post-operative deaths and post-operative morbidity as the result of the administration of ether are undoubtedly much greater than is generally supposed. Gellhorn, in a recent paper on Spinal Anæsthesia, says: "There are no statistics in existence which give a true picture of the alleged harmlessness of the open ether-inhalation narcosis. The exact number of fatalities due to ether will never be known, nor has the rôle of ether in the causation of post-operative complications which injure life and health of the patient ever been exhaustively considered. Few men have the courage to publish their failures, and the medical journals, as Sellheim remarks, serve as a medium for recounting accidental success rather than the reverse."

MULTIPLE OPERATIONS

It is frequently desirable, or even necessary, to perform a number of operations at one time. Thus, not uncommonly, a dilatation of the cervix, curettement, trachelorrhaphy, or trachelectomy, anterior and posterior colporrhaphy, and a round-ligament suspension of some variety are performed at the one operation. Very often, in addition to the plastic operations mentioned, the sphincter ani may be stretched, a fissure incised or curetted, or hemorrhoids removed. After the abdominal cavity is opened it may be found desirable to remove a tube, an ovary, or the appendix; there may be intestinal adhesions to be divided (Lane's kink) and even gall-stones to remove. To what extent these multiple operations should be carried depends upon the condition of the patient, the urgency with which each of them is demanded, and the skill and speed of the operator. When it is inadvisable to correct all the abnormalities existing, those giving rise to the most pressing symptoms should be selected. If, by careful examination, the operator has acquainted himself with the amount of surgery that needs to be done, he can usually so modify or hasten his operative procedures as to accomplish them all without detriment to the patient. Thus, if the examination under ether just previous to operation has shown that, in addition to plastic operations, the patient requires an intrapelvic operation of considerable magnitude, the simplest and most rapid methods for the plastic work should be adopted. This possibility means, in a few cases, a less complete restoration of the parts than if undivided attention had been given to the plastic work, and yet it will be vastly better than to neglect this aspect of the case entirely. Familiarity of the operator with his surroundings and assistants will be conducive to speed, and the opposite, of course, is true. It is unwise, when the abdomen is opened for other purposes, invariably to remove the appendix, regardless of its condition and of that of the patient. Gall-stones, if quiescent, should not be removed if the additional time under anæsthesia required would be of detriment to the patient. It is better deliberately to plan two operations on the same patient than to jeopardize her life by attempting to do too much at one time.

OPERATIONS DURING PREGNANCY

It need not be stated that operations should, if possible, be avoided during pregnancy. Nevertheless, there are certain diseases that demand operation as soon as they are discovered, and other conditions are encountered that may require operation if pregnancy is to continue or to terminate successfully. In the first class are malignant growths and acute intra-abdominal or pelvic disorders. Among them may be mentioned carcinoma of the cervix, acute appendicitis, torsion or rupture of an ovarian cyst, or torsion of a pedunculated myoma. In this condition pregnancy does not constitute a contraindication to operation; indeed, pregnancy makes the operation even more imperative. The exact procedure in such cases will depend upon the month of pregnancy. If the child is viable, Cæsarean section should precede a hysterectomy for carcinoma. If the woman is in the last month of pregnancy, a small muscle-splitting incision may be successful in exposing and permitting removal of a clean appendix, and the woman may be allowed to go to term; if, however, a larger median or muscle-splitting incision is required, Cæsarean section is advisable. Ovariectomy for twisted or ruptured ovarian cyst at or near term should be followed by Cæsarean section. In the earlier months both operations may be undertaken with the least possible disturbance of the uterus, and the administration of bromides and morphine should constitute a part of the post-operative treatment. The most difficult cases in which to reach a decision are those of suppurative appendicitis with spreading peritonitis, in which drainage must be instituted, and in which Cæsarean section adds decidedly to the risk of sepsis. This is really a problem of obstetrics. DeLee declares that a mild attack of appendicitis should always indicate an operation within the first five months of pregnancy. Only perforating cases should be operated on within the last four months, and then as soon as the condition is diagnosed. In cases of doubt, operation is the safer course. Every effort should be made to prevent premature labor. Should it, however, set in, it should be allowed to run as natural a course as possible. If abortion is impending at the time of operation the uterus should first be emptied and then drainage of the abdomen carried out. DeLee believes that the question of a Porro Cæsarean section at the time of operation on the appendix must be considered.

The plan of Gerster should be borne in mind. This observer first removes the appendix and packs the diseased area or abscessed cavity with gauze, over which he tightly closes and seals the abdominal incision with collodion. The patient is then delivered in the ordinary way, and after labor is completed, the sutures are removed and drainage instituted.

Another problem is presented by the adherent and pregnant, retroverted and retroflexed uterus, or by a pregnant uterus that is securely anchored to the anterior abdominal wall. In the first case it is best to treat the patient expectantly, for the adhesions sometimes stretch as the uterus enlarges. The outlook is improved by the regular use of the knee-chest position (five minutes), followed by the Sims' position for twenty minutes three times a day. Although an operation could be performed and the uterus restored to its normal position, miscarriage is very apt to follow, and a recent opera-

tion on the uterine ligaments would increase the difficulties of handling an abortion. If abortion occurs while the expectant plan is being pursued, the uterus can be cleaned out, if need be, without danger, and an operation to correct the malposition carried out at a later date. When the pregnancy takes place in a uterus that is fixed to the abdominal wall, the patient should be carefully observed—in a certain proportion of cases the attachment will stretch and the pregnancy go on. If abortion occurs, the case should be handled *secundum artem*; later an operation for the release of the uterus should be advised. If the case progresses to term, any dystocia should be promptly met with Cæsarean section or other suitable operative procedure.

DRAINAGE

Drainage after intraperitoneal operations is employed much less frequently than formerly. This is due partly to the improved technic and to the selection of cases at a more favorable stage for operation. It is also partly due to the disadvantages incident to drainage, *viz.*, a more prolonged convalescence, repeated dressing of the wound, which may be painful, and faulty healing of the incision, predisposing to hernia.

The first drains were used for the purpose of removing what was believed to be septic fluid from the site of operation. This is the original and more common idea in the use of a drain following operation. In addition to being useful for the purpose of removing infectious products and directing the flow of toxic fluids externally, thus preventing their absorption by the peritoneum, a drain also serves the purpose of what may be called a *protective pack*; in other words, by virtue of the adhesions that form about the drainage material within six or eight hours, the drain effectually shuts off the healthy peritoneal cavity from the operative or infected region. There should, therefore, be a distinction between a drain and a protective pack. Drainage, in the true sense of the word, may be maintained for some time from an encapsulated abscess or from a hollow viscus, such as the gall-bladder, but in any other position after a short period a drain becomes a protective pack. It serves, therefore, no longer as a drain for anything more than the fluids that are thrown off by the surface immediately in contact with it. As it is impossible, for this reason, to drain the peritoneal cavity for any length of time, all drainage after a brief period, becomes a protective pack. It is true, however, that during this short interval drains may serve their purpose of removing toxic fluids and preventing their accumulation in the peritoneal cavity.

The absorption of toxic products from the peritoneal cavity has been shown by a number of investigators to be most active in the upper part, toward the diaphragmatic area. The peritoneum possesses naturally a considerable amount of resistance to infection, and this resistance is enhanced by the omentum, which quickly adheres to and surrounds inflamed and infected areas, and helps to destroy infectious material or to neutralize it, by throwing out large numbers of white blood-corpuscles, which have a phagocytic action and encapsulate or destroy bacteria. Since, as has been stated, the upper part of the peritoneal cavity is the most active area of absorption, and since the use of drains in an endeavor to drain the entire peritoneal cavity is no longer considered reasonable, postural drain-

age is becoming the common method of dealing with intraperitoneal infections; in other words, although we cannot drain the entire peritoneal cavity by means of drainage-tubes of any variety or in any position for any length of time, by elevating the trunk of the patient intraperitoneal fluids may be made to gravitate toward the pelvis, where absorption of toxic products will be at a minimum, where, from the anatomy of the abdominal cavity septic products are most likely to be encapsulated, and where they will interfere less with the functions of digestion and assimilation. If, then, in combination with posture, a drain is placed at a dependent point, actual drainage will occur during the first six or eight hours, and thereafter a drain will serve the purpose of a protective pack. In many cases this is all that is required to turn the tide of battle between the toxic products of the infection and the vital resistance of the patient in favor of the latter. At the present time drainage is rarely used except in acute conditions of the pelvis or the abdomen.

As it is a well-established practice at the present day to avoid operation during the acute stage of gonorrhœal and other forms of pelvic peritonitis, and as operation is not performed in the presence of puerperal infection, except when a rapidly spreading general peritonitis or a localized collection of pus is present, drainage will be demanded only in cases of spreading peritonitis caused by perforation of the appendix, a duodenal ulcer, or similar conditions. In a spreading peritonitis, whatever the cause, the operation must be performed rapidly under that form of anæsthesia which will produce the least depression and lowering of the vital resistance. The infected focus should be removed with as little disturbance and manipulation of the surrounding parts as possible. One or two drains should be placed in the most dependent part of the abdomen or pelvis, and the patient placed in the sitting position. In the course of the ordinary pelvic operations drainage need be used only in exceptional cases. Such cases may be divided into three groups, as follows:

(1) When the small intestine, the rectum, or the sigmoid has been injured in the separation of adhesions and there is doubt as to the security of the sutures closing the rent.

(2) When a large amount of exudate or a considerable portion of an abscess sac must be left behind.

(3) To favor hæmostasis and to provide free exit in case of extensive oozing.

In the case of intestinal injury the greatest care should be observed to render the intestinal sutures absolutely secure, in which case, of course, a drain will be unnecessary. If a drain is used, it should be so disposed that it does not come in contact with the row of sutures, otherwise the drain may actually interfere with perfect union.

The second group of cases is very exceptional, but may be found in puerperal or post-abortion cases of pelvic inflammatory disease. Under such circumstances the broad ligament is often markedly thickened and infiltrated, and the raw surfaces exposed cannot be satisfactorily covered by peritoneum. As such surfaces will necessarily "weep" and discharge septic fluid into the pelvis, a drain or a protective pack is introduced to carry this fluid away externally, so that it neither accumulates in the pelvis,

where it might set up peritonitis, nor is absorbed in the general circulation, where it might produce a toxæmia.

Whenever practicable, pelvic drainage should be conducted through Douglas' pouch. The opening between the vagina and Douglas' sac may be made by having an assistant pass a pair of long curved artery-forceps to the posterior vaginal cul-de-sac. The blades are then separated laterally for about an inch, and the operator makes an incision directly between them. One end of the rubber drainage-tube with a gauze wick is then pulled into the vagina with the aid of forceps. In some cases drainage through the posterior vaginal incision will not be so feasible as drainage immediately above the symphysis, Fig. 492. This will be true when the surfaces to be drained or excluded are high, also when the drain is used for the control of hemorrhage and when haste is necessary. Under such circumstances rubber tubing with gauze wicks should be used, or the gauze should be surrounded with rubber-dam, so as to prevent the formation of adhesions between the drain and the surrounding intestines, and thus facilitate removal of the gauze. Care should be taken that the incision is not closed tightly about the point of exit of the drain.

In *acute appendicitis* with *abscess* or *spreading peritonitis*, a rubber tube with a gauze wick should be passed to the bottom of Douglas' pouch, and another one to the most involved area in the right iliac fossa. It may be advantageous to bring this drain out through a stab wound in the loin, directly above the crest of the ilium, and an inch and a half behind the anterior spine, especially when the damaged area lies to the right of the cæcum or beneath it.

Gall-bladder and Gall-duct.—*It is always advisable to drain the gall-bladder after performing cholelithotomy.* This should be done by fastening a piece of rubber tubing, about the caliber of a lead pencil, in the center of the gall-bladder incision. The tube should be fixed and the remainder of the incision into the gall-bladder closed with catgut sutures. A circular suture of catgut is now placed around the gall-bladder about an inch below its summit, and the gall-bladder inverted as the suture is tied. This prevents leakage, and when the rubber tube is removed, serous surfaces will lie in apposition and union rapidly take place. It is not necessary and quite undesirable to attach the gall-bladder to the peritoneum of the abdominal incision. (The tube is usually removed about the tenth day, when the catgut sutures are absorbed.)

If the *gall-bladder is infected* or the *surrounding parts have become soiled*, a cigarette drain should be placed in the peritoneal cavity below the gall-bladder.

After *simple choledochotomy* the incision in the common duct may be closed, and drainage provided through the gall-bladder. When the gall-ducts are infected, a rubber tube should be passed upward toward the hepatic ducts, and fixed in the line of incision with a catgut suture. After *cholecystectomy* a drainage-tube should be inserted down to the stump of the cystic duct.

After an operation for perforating ulcer drainage will be indicated at the site of the lesion and elsewhere, if there has been extensive soiling of the

peritoneum. Drainage may not be required if the case is operated on within six hours. When, however, twelve hours have elapsed, it is safer to employ drainage.

Pancreas.—Drainage should be employed in connection with every form of surgical operation on the pancreas. According to Moynihan, the only exceptions to this rule are cases in which no pancreatic fluid has escaped during the procedure, and the peritoneal incision used to expose the pancreas has been closed by suture.

Kidney.—A paranephric abscess demands free drainage. After aseptic cases of nephrotomy, pyelotomy, or nephrolithotomy, when the kidney incision is clean cut and can be accurately approximated, no drainage is required. If the incision is ragged or if there has been much traumatism, the paranephric tissues should be drained. Septic cases require drainage of the kidney wound itself and of the paranephric fat.

After ureterotomy for stone or stricture, if the wound is clean and well approximated, no drains are necessary, but otherwise a small rubber tube should be fixed at some distance from the line of sutures.

Bladder.—Drainage of the female bladder is required after operation for vesical stone and fistula, and is readily accomplished by the introduction of a self-retaining (mushroom) catheter through the urethra.

If the bladder is greatly inflamed and complete and constant drainage is desired, the organ should be opened at its base by an incision through the anterior vaginal wall. The vesicovaginal fistula thus made is kept open by the introduction of a mushroom catheter or by uniting the vesical to the vaginal mucosa.

Post-operative Care in Drainage Cases.—Gauze packing introduced into the vagina or the uterus for the purpose of controlling hemorrhage should be removed within from twenty-four to thirty-six hours. Twenty-four hours after the introduction of gauze and rubber drains into the peritoneal cavity for the purpose of controlling hemorrhage, both the gauze and the rubber tubing may be removed, and the incision closed by tying the suture or sutures previously placed for that purpose. In cases of pelvic or abdominal infection drains must be allowed to remain much longer. The gauze inlays, if they fit the rubber tube loosely and do not project beyond it, should be removed at the end of twenty-four hours.* The rubber tubes are left in place until the fifth post-operative day. At that time the tubes are started (loosened), and every day after this an inch or more is cut off. The abdominal wound is dressed daily, particular care being used to keep the line of incision clean. It is advantageous to moisten the layers of gauze covering the incision and the layer covering the drainage-tubes with a 1:2000 solution of mercury bichloride.

When gauze has been used in septic cases without a protecting rubber envelope, as in vaginal drainage into the pouch of Douglas, or when the gauze wicks project considerably beyond the ends of the tubes, no attempt should be made to remove the gauze for from five to seven days. After this period a little at a time may be gently loosened each day, pulled out, and cut off. *No force dare be used.* Gauze drains loosen about the time they should be removed. Undue haste will break up protecting adhesions and may

cause an extension of the infection and peritonitis. Solutions of any sort must never be injected into an intra-abdominal drainage tract.

Gall-bladder or bile-duct drainage is usually maintained for about ten days; after this the tubes are gently tugged upon each day until they come away easily. In infected cases the drainage is allowed to remain for a longer time, or until the symptoms subside. Intraperitoneal drains introduced in connection with gall-bladder or gall-duct operations are treated in the same way as intraperitoneal drains in other localities.

Kidney drainage, in septic cases, is continued until the symptoms subside and the wound is clean. When drains have been introduced for the purpose of effecting hæmostasis they may be removed at the end of twenty-four hours. (For a description of enteroclysis, which is frequently invaluable when combined with drainage, see Chapter XXXVII, page 667.)

BIBLIOGRAPHY

- ANSPACH, B. M.: "Experiences with Spinal Anesthesia in Pelvic Surgery." *Amer. Jour. Obst.*, 1914, lxix, 3.
- BALDY, J. M.: "Surgical Injuries to the Ureters." *Amer. Gyn. and Obst. Jour.*, 1894, v.
- BEVAN, A. D.: "The Choice and Technique of the Anesthetic." *Jour. Amer. Med. Assoc.*, 1915, lxxv, 1418; *Ibid.*: "On the Surgical Anatomy of the Bile-Ducts and a New Incision for Their Exposure." *Annals of Surgery*, 1899, xxx, 15.
- BOVÉE, J. W.: "Complete Sterilization of the Skin by Iodine." *Trans. Amer. Gyn. Soc.*, 1914, xxxix, 379; *Ibid.*: "An Investigation of the Use of Iodine in Skin Sterilization for Surgical Purposes." *Amer. Jour. Obst.*, 1911, lxiv, 91-106; *Ibid.*: "The Influence of the Trendelenburg Position on the Quantity of Urine Excreted During Anesthesia." *Trans. Amer. Gyn. Soc.*, 1910, 443.
- CLARK, J. G.: "A Critical Review of Seventeen Hundred Cases of Abdominal Section from the Standpoint of Intraperitoneal Drainage." *Amer. Jour. Obst.*, 1897, xxxv; *Ibid.*: "Intraperitoneal Drainage." *Amer. Jour. Obst.*, 1897, xxxv, No. 4, 481.
- COFFEY, R. C.: "Abdominal Adhesions." *Trans. Sect. O. G. and A. S., A. M. A.*, 1913, 201.
- CRILE, LOWER: *Anoci—Association*. Saunders, Philadelphia, 1914.
- FARR: "Local Anesthesia in Abdominal Surgery," *Trans. Sect. O. G. & A. S., A. M. A.*, 1917, 164.
- FINDLEY, P.: "Appendicitis Complicating Pregnancy, Labor, and the Puerperium." *Amer. Jour. Obst.*, 1909, lx, 993.
- FOWLER, G. R.: "The Toilet of the Peritoneum in Appendicitis." *Trans. Amer. Surg. Assoc.*, 1903, xxi.
- FOWLER, R. S.: "The Treatment of Diffuse Septic Peritonitis Following Appendicitis." *New York Jour. Med.*, 1907, vii; *Ibid.*: "Results in Diffuse Septic Peritonitis Treated by the Elevated Head and Trunk Position." *Med. News*, May 28, 1904.
- FRANZ, K.: "Die Schädigungen des Harnapparates nach abdominalen Uteruskarzinomoperationen." *Zentralbl. f. Gyn.*, 1909, 601.
- GELLHORN, G.: "Spinal Anesthesia in Gynecology." *Trans. Amer. Gyn. Soc.*, 1914, xxxix, 212.
- GERSTER, O. G.: "On the Technical Considerations Influencing the Surgical Treatment of Appendicitis Occurring During Pregnancy." *Phila. Month. Med. Jour.*, March, 1899, 170.
- GRASSICH, A.: "Eine neue Sterilizierungs Methode der Haut bei Operationen, Vorläufige Mitteilung." *Zentralbl. f. Chir.*, 1908, xxxv, 1289.
- GRAVES, W. P.: "Division of the Ureter in Pelvic Operation." *Boston Med. and Surg. Jour.*, 1917, clxxvi, 149.
- HERTZLER, A. E.: "Local Anesthesia in Prevention of After-Pain and Shock." *Jour. Amer. Med. Assoc.*, 1914, lxiii, 2037; *Ibid.*: "Quinine and Urea Hydrochloride as a Local Anesthetic." *Jour. Amer. Med. Assoc.*, 1919, liii, 1393.
- HOWLAND, J., and RICHARDS, A. N.: "Experimental Study of the Metabolism and Pathology of Delayed Chloroform Poisoning." *Jour. Exper. Med.*, 1909.
- JUDD, E. S.: "Transplantation of the Ureter Following Traumatism and Resection of the Bladder for Cancer." *Surg., Gyn. and Obst.*, 1917, xxiv, 635.

- McARTHUR, L. L.: "A Modified Incision for Approaching the Gall-bladder." *Surgery, Gynecology and Obstetrics*, 1915, xx, 83.
- McBURNAY: "The Incision Made in the Abdominal Wall for Appendicitis, with the Description of a New Method." *Annals of Surgery*, 1894, xx.
- MAYO, W. J.: "The Incision for Lumbar Exposure of the Kidney." *Annals of Surgery*, 1912, lv, 63.
- MAYO-ROBSON, A. W.: "Modifications and Improvements in Operations on the Biliary Passages." *Brit. Med. Jour.*, January 24, 1903, 181.
- MURPHY, J. B.: "Diffuse Suppurative Peritonitis." *Trans. Amer. Assoc. Obst. and Gynecol.*, 1906, xix, 176.
- NOBLE, C. P.: "Overlapping the Aponeuroses in the Closure of Wounds of the Abdominal Wall." *Annals of Surgery*, March, 1906, 349.
- NORRIS, R. C.: "Operations During Pregnancy." Chap. xxviii, *Kelly-Noble Gynecology*, vol. ii, Phila., Saunders, 1907.
- OLSHAUSEN: "Über die Drainage." *Zeit. f. Geb. u. Gynäk.*, 1903, xlviii.
- PEASLEE: "Infections into the Peritoneal Cavity after Ovariectomy." *Amer. Jour. Obst.*, 1871, iii, 300.
- PFANNENSTIEL: "Über die Vortheile des suprasymphysären Fascienquerschnitt für die gynäkologischen Kōliotomien, zugleich ein Beitrag zu der Indikationsstellung der Operationswege." *Samml. klin. Vortr.*, Leipzig, 1900, No. 268.
- SAMPSON, J. A.: "Ligating and Clamping the Ureter as Complications of Surgical Operations." *Amer. Med.*, 1902, lv.
- SCHEIB, A.: "Klinische und anatomische Beiträge zur operativen Behandlung des Uterus Carcinoms." *Archiv f. Gyn.*, 1909, lxxxvii, 1-233.
- STOECKEL: "Über die Behandlung des Verletzten und Unverletzten Ureters bei Gynäkologischen Operationen." *Zeit. f. Gyn., Urologie*, 1911, Bd. iii, S. 51.
- SWEET, J. E., CHANEY, R. H., WILSON, H. L.: "Prevention of Post-operative Adhesions in Peritoneal Cavity." *Annals of Surgery*, 1915, lxi, 300.
- TETER, C. K.: "Nitrous Oxid-Oxygen in General Surgery and Obstetrics." *Lancet Clinic*, Cincinnati, O., 1914, cxii, 627.
- TRENDELENBURG, F.: "Über Blasenscheiden—Fistel Operationen, und über Beckenhochlagerung bei Operationen in der Bauchhöhle." *Volkman's Sammlung klinischer Vorträge*, 1890, No. 355 (*Chirurgie* No. 109).
- WHIPPLE, G. H., SPERRY, J. A.: "Chloroform Poisoning, Liver Necrosis and Repair." *Bulletin Johns Hopkins Hospital*, September, 1909.

CHAPTER XXXVII

POST-OPERATIVE TREATMENT

Nausea and Vomiting.—After ether, and to a less extent after chloroform anæsthesia, there may be considerable nausea and vomiting; this usually subsides in from six to eighteen hours. It may be difficult to relieve. The patient should be carefully observed, so that none of the vomitus is aspirated into the trachea. For this reason, during the retching and straining, the head of the patient should be turned to one side, the angles of the jaws pressed forward, and the mouth held open, in order to permit ready escape of the regurgitated material. Most patients complain of thirst, but water, except in small amount, is promptly ejected from the stomach. Where the vomiting is not attended by danger to the patient, she should be encouraged to drink freely of warm water containing a little (2 per cent.) bicarbonate of soda or common salt. This is either quickly rejected by the stomach, or passes through the pylorus into the bowel. In either case relief will be obtained, which may indeed be but temporary, so that the expedient may have to be repeated when the retching and nausea return.

If it is especially desirable to keep the patient quiet and to avoid violent contractions of the diaphragm and the abdominal wall, then one gives no water by mouth but relieves the thirst, as far as possible, by applying cold compresses to the lips and giving small bits of cracked ice. In the meantime enteroclysis, with 2 per cent. soda bicarbonate solution, will gradually relieve the intense thirst.

Thirst.—Post-operative thirst may be in a measure anticipated by introducing a quart or two of 2 per cent. soda bicarbonate solution into the sigmoid and colon before the patient leaves the operating table. The enteroclysis may be repeated at intervals of from three to six hours, from eight ounces to a pint of solution being used at a time. The solution is run slowly into the rectum through a soft-rubber catheter; this can be accomplished easily in thirty minutes, when the catheter should be removed. For most patients interrupted is more comfortable than continuous enteroclysis. After the patient is able to take fluids by the mouth, the quantity and frequency of the saline infusions may be reduced.

Pain.—When morphine and atropin are given routinely either before or immediately after operation, the patient does not complain much of pain within the first few hours. As a rule, she sleeps or is drowsy. If, after the patient is well out of the anæsthetic and the effect of the hypodermic injection has worn off, there is marked pain, or if she is restless or apprehensive, heroin in 1/12 grain doses by hypodermic injection may be given, and repeated as required, but at most not oftener than every three hours. By this means the patient is kept quite easy during the first twenty-four hours, and in the majority of cases is spared the great distress and discomfort which would otherwise follow.

Diet.—Immediately after operation the patient has no desire for solid or semi-solid food; but there is a great craving for liquids, and after the first six or eight hours, or as soon as the stomach displays a tendency to be retentive, the patient should be allowed small sips of plain hot water, albumin water, milk and lime water (equal parts), or buttermilk or weak tea (1 to 4 drams every half hour). As the stomach becomes more retentive, the amount taken may be increased to 1 to 2 ounces every hour. During the first three days of the convalescence nothing but fluids should be given, but after the third day, if the bowels have been moved satisfactorily and the patient manifests no disquieting abdominal or general symptoms, soft, semi-solid food may be given, and in the course of two or three days more this may be increased to the regular house diet.

Departures from this course must be made under some circumstances. If the operation has involved the **upper part of the alimentary canal**, the amount of liquid taken by the mouth must be restricted, the thirst and craving for liquids being assuaged by the use of soda solution introduced into the bowel. When the operation has involved the **lower part of the intestinal tract**, there is little danger from the use of liquids by the mouth, even in considerable quantities, but if the colon, or especially the sigmoid flexure or the rectum, has been affected, enteroclysis must be avoided. After complete tear operations, or when it is desirable to avoid abdominal distention or the use of enemas or purgatives for a considerable time, the diet should be restricted entirely to albumin water, which is readily absorbed and quite fully digested, so that little residue is left in the bowel.

Bowels.—In the average patient (drainage cases and complete tear operations excepted) it is well to leave the bowels undisturbed until seventy-two hours have elapsed from the time of operation, when a simple enema, consisting of soapy water (1 to 2 pints) may be given. This usually has the desired effect, the bowels moving freely and considerable gas being expelled.

If the simple enema is not effectual, a compound enema (Epsom salts, 2 ounces; glycerine, 2 fluidounces; sweet oil, 4 fluidounces; water, sufficient to make 1 pint) should be introduced through a tube, passed into the sigmoid flexure; or an enema of glycerine (4 ounces) or one of alum (1 to 4 drams to 1 pint of water) may be tried. Plenty of time should be given for one enema to act before another is ordered. The patient may be much distressed by too great haste. For the first five days the bowels should be moved daily with an enema. At the end of that time when the temperature is normal and there are no indications of peritonitis or obstruction of the bowel it is well to give the patient some simple laxative every night (paraffine oil, 4 drams with cascara, 2 grains or phenolphthalein, 2 grains), supplemented by an enema in the morning, if necessary.

In **drainage cases** it is good practice to make no attempt to move the bowels for five days, the only indications for the use of the rectal tube or a simple enema being undue distention of the abdomen and inability of the patient to pass flatus. If the abdomen remains fairly flat and the patient does not complain of gas pains, it is well not to disturb her until the end of the fifth day, when an enema may be given. This should be repeated daily until the tenth day, when mild laxatives may be started (see page 665).

After **complete tear operations**, the bowels should be kept locked for a week, no enemas being permitted during that time, and the patient being allowed nothing but liquid food in minimum amount. About the fifth day, paraffin oil should be given in dose of 4 fluid drams three times a day, and on the seventh day, an ounce or two of castor-oil. Thereafter, the mineral oil should be continued daily combined with cascara or phenolphthalein.

If, during the first post-operative week the patient becomes very uncomfortable by reason of an accumulation of gas or fæces in the lower bowel, a small enema may be given through a soft-rubber catheter, well lubricated, and passed with great care through the sphincter. During the insertion of the catheter, it should be pressed against the posterior commissure so as to avoid the line of suture. The nurse must be carefully instructed upon this point.

The *use of cathartics immediately* after operation is contraindicated. If the patient has been properly prepared, there is nothing in the intestinal tract that must be expelled at once, so that there is no need for active catharsis. On the contrary, it is generally better to limit peristalsis for the first forty-eight hours. This is particularly true if there is imminent danger of peritonitis, for then peristaltic action will tend to spread infection. Cathartics are capable of much mischief if there is partial obstruction or a kink in the bowel or if the integrity of the alimentary tract has been threatened by the operation. In other words, in the early post-operative days cathartics are troublesome and produce discomfort; they are unnecessary, and they are often harmful. Their use should be avoided until the danger of peritoneal and gastro-intestinal complications is over. After the bowels have been well moved by enemas, the temperature and the peristalsis have returned to normal, and the patient takes food without discomfort, a mild laxative may be employed daily if necessary.

Bladder.—The urinary excretion is always diminished after operation because of the restriction of liquids and the thorough evacuation of the intestinal tract previous to anæsthetization. If salt solution has been given subcutaneously or soda solution has been injected into the bowel, at the close of the operation the urinary excretion will be increased, but it rarely exceeds 24 fluidounces during the first post-operative day; after this, in normal cases, it increases with the amount of liquids ingested. As so many gynecologic operations involve the bladder or its neighboring structures, it is generally advisable to avoid any great distention of the bladder within the first few days of the operation. It is a good rule, therefore, to have the patient void urine or to catheterize her within eight hours, and to repeat the process at eight-hour intervals. After suspension of the uterus, operations for shortening the round ligaments, extensive operations for cystocele, etc., the bladder should be emptied every six hours during the first two days. If the amount excreted during the first twenty-four hours falls below 16 fluidounces, the urine should be examined and a careful investigation made for possible sources of suppression or retention. Most patients are able to empty their bladder voluntarily after the second or third day. There are some exceptions, however, in which repeated catheterization is necessary for a week or more. Taussig showed that retention

was most common after interposition operations for prolapse and radical operations for cancer of the cervix. He says that the important factors in urinary retention are interference with the blood-supply of the bladder, direct or indirect pressure or irritation about the urethral sphincter, excision of the nerve supply of the bladder, and interference with the control of the central nervous system, through anæsthetics, narcotics, or mental processes. As the continued use of the catheter predisposes to cystitis, the patient should be encouraged to void urine voluntarily; during the effort an elevated pos-

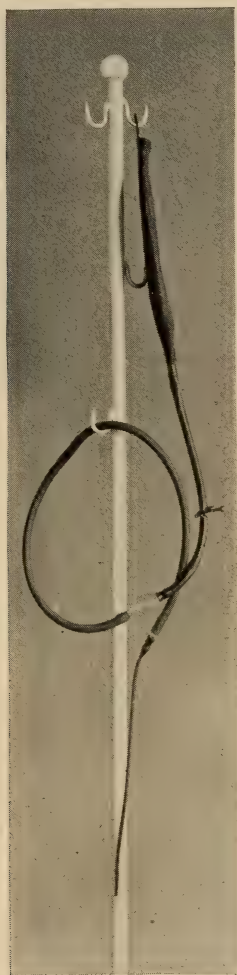


FIG. 494.—Enteroclysis apparatus with visible drip.

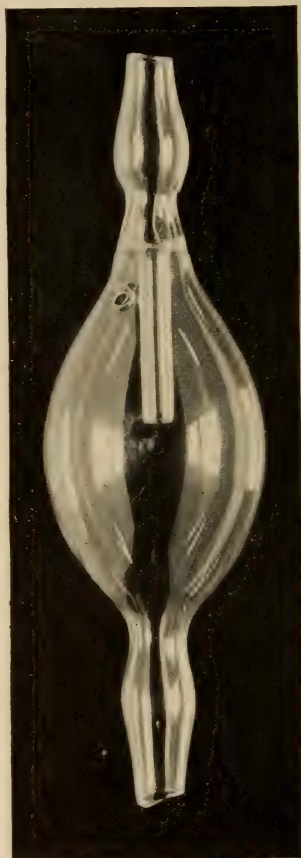


FIG. 495.—Visible drip glass connecting tube.

ture may be assumed and will often prove helpful; the sound of running water acts sometimes as a suggestion. Late in the convalescence the patient may be allowed to step out of bed and use a commode. Injections of the extract of the pituitary gland (pituitrin, 1 ampoule) will often stimulate the smooth muscle-fiber of the bladder sufficiently to bring about evacuation of the bladder. The sphincter muscle of the bladder is some-

times relaxed by a low enema of warm saline solution, and this may have the desired result. A plan that is sometimes successful consists in injecting into the bladder, when the patient expresses a desire to void urine, one ounce of sterile glycerine. If no result follows the first effort, it may be repeated several times, since it does no harm. If there is no result within thirty minutes of the injection, the patient should be catheterized. The most scrupulous care must always be taken in performing catheterization in post-operative cases.



FIG. 496.—Bed with head elevated.

Enteroclysis is an important part of the after-treatment in many cases. Two per cent. sodium bicarbonate solution, normal salt solution, or tap water may be used. Ordinarily, sodium bicarbonate (2 per cent.) solution is preferable. The solution may be thrown into the bowel at the close of the operation in one large injection (1 to 2 liters) while the patient is still under the influence of the anæsthetic, or it may be given later by continuous or interrupted enteroclysis. Enteroclysis is a valuable method of supplying fluids to the body when they cannot be ingested or when it is inadvisable to give them by the mouth.

By the term *continuous* enteroclysis is understood the continuous introduction of solution in quantities proportionate to the rate of absorption. By *interrupted* enteroclysis is meant the introduction into the rectum, at intervals, of fluid in such quantity as can be retained comfortably and readily absorbed within an estimated period of time. For either method a small rubber catheter is passed as high into the rectum as it will go without causing discomfort, and attached to a reservoir containing the solution. In continuous enteroclysis a visible drip may be used, so that the rate of flow can easily be regulated; this is done either by compression of the hose or by the degree of elevation of the reservoir. Thirty drops a minute amount to nearly six pints in twenty-four hours. By the interrupted method one pint of solution may be run into the bowel immediately after the operation; from eight to twelve ounces may be slowly introduced every three hours, about a half hour being consumed with each injection.



FIG. 497.—Fowler bed.

In desperate cases continuous enteroclysis will be the most satisfactory method, whereas for the ordinary post-operative treatment, the interrupted form will be associated with less discomfort to the patient.

As convalescence progresses, the frequency of the rectal infusion may be lessened as the intake by the mouth is increased.

Posture.—During the first post-operative hours the patient is allowed to remain flat on her back. When the effect of the anæsthetic begins to wear off the trunk should be elevated (Fig. 497). This may be accomplished in several ways: blocks may be placed under the head of the bed, a portable elevating frame may be placed on the bed, or the shoulders and head may be raised with pillows. In any of these plans the tendency of the patient to slip down may be combatted by placing a sand-bag and pillow beneath the buttocks; these are held in place with a length of stout muslin bandage fastened to the frame of the bed. Such elevation of the trunk and support of the buttocks are much facilitated when the bed is fitted with a Gatch frame, as shown in Fig. 497.

Elevation of the trunk or the Fowler position is more conducive to comfort than the horizontal position. It promotes the drainage of peritoneal fluids into the pelvis, localizes peritoneal infection to that region, and hinders the development of a general peritonitis. In cases of threatened cardiac dilatation it relieves the congested right heart. It also prevents hypostatic congestion of the lungs.

Elevation of the pelvis, or the Trendelenburg position, which is the opposite of the Fowler position, is used as a post-operative measure only in shock and cardiac failure from hemorrhage. In this position the weight of the venous column of blood upon the right heart promotes contraction of that organ and stimulates the circulatory function; it is never used for any length of time. As soon as reaction is established the Fowler position is resumed.

In cardiac failure from right-sided hypertension or dilatation, this position is contraindicated. Under such circumstances the Fowler position should be instituted at once (see Post-operative Cardiac Dilatation, p. 692).

Out of Bed.—Following the average laparotomy or perineal operation, the patient is permitted to get out of bed on the tenth day. In the case of extensive plastic and suspensory operations this may be delayed until the fourteenth day.

In all cases in which convalescence has progressed normally the patient may walk about at the end of two weeks and from that time onward gradually resume her usual activities.

Six weeks should be allowed for complete convalescence, and strenuous exercise and hard work should be avoided for at least that period.

Dressing the Incision.—Unless there are symptoms of infection or hemorrhage, the celiotomy incision should not be disturbed for a week or ten days. At that time the wound is inspected, non-absorbable sutures are removed, the skin is cleansed with alcohol, and a fresh dressing is applied.

The wound should be protected with a gauze dressing until healing is complete and the scar is smooth and dry.

CHAPTER XXXVIII

POST-OPERATIVE COMPLICATIONS

SHOCK

Cause.—Shock is the depressing influence on the cerebrospinal system that results from hemorrhage, prolonged anæsthesia, severe pain, extensive trauma, and exposure and handling of the abdominal viscera. The effect is believed to be brought about by afferent nerve impulses or by impoverishment of the circulating blood. The most frequent cause is loss of blood, but all the other factors play a part, and occasionally they play the leading rôle.

The pathologic condition is not definitely known; but an anæmia of the brain, a loss of control of the vasomotor centers, a diminution in the tone of the blood-vessels, an accumulation of the blood in the larger venous trunks of the splanchnic plexus, and a weakening in the force of the circulation are said to be present. Shock is observed during, immediately after, or within a few hours of operation.

Symptoms.—The symptoms of shock are pallor and cold perspiration; the pulse is rapid, weak, and easily compressed, and in severe cases it is almost imperceptible; the respirations are rapid and shallow; the face is expressionless; the jaw drops, the eyes are dull and staring, the pupils react very slowly, and the temperature is one or two degrees below the normal. Shock must be differentiated from secondary hemorrhage and acute post-operative dilatation of the heart (see Hemorrhage, p. 672, and Acute Post-operative Dilatation of the Heart, p. 690).

Treatment.—Treatment must be promptly and energetically applied. The foot of the bed should be elevated, the head and chest of the patient should be low, in order to favor the return of venous blood to the heart.

If operative hemorrhage has been the cause, the lower extremities from the soles to the groins may be tightly bandaged.

The patient should be surrounded by hot-water bottles and blankets; in extreme cases massage and vigorous rubbing may do some good. Stimulants, such as extract of the pituitary gland (pituitrin, 1 ampoule), strychnine (1/30 to 1/15 grain), camphor (1 to 2 grains), in sterile sweet oil, should be administered hypodermically. A hot enema of black coffee is often of considerable benefit, and whiskey (1 ounce to 2 pints of saline solution) may be administered in the same manner.

Hypodermoclysis, or the intravenous injection of normal saline solution, is of the greatest value. The addition of suprarenal extract (adrenalin chloride, 5 to 10 minims to each pint of the salt solution) will help restore vasomotor tone. If the patient is restless or complains of pain while these procedures are being carried out, hypodermic injections of morphine and atropin may be used with great advantage. Improvement in the patient's condition may be rapid or slow, or the symptoms may become increasingly

worse and death ensue. If improvement sets in, the treatment just outlined may be continued, guarding the patient against overstimulation.

Shock may be avoided by carefully preparing the patient for operation, curtailing the anæsthesia, limiting the loss of blood, and avoiding as much as possible undue exposure and handling of important viscera (see Chapter XXXVI).

HEMORRHAGE

Varieties.—Hemorrhage following operation may occur in a number of forms. Thus it may be: (1) A slow, continuous ooze from the capillaries of a raw surface; (2) a steady flow from a vein; or (3) an active spurt from an artery. Post-operative hemorrhage may be a continuation of the hemorrhage that took place at the time of the operation, and that was not entirely controlled, or it may be due to the slipping of a ligature some time later, or it may be the result of the infection and disintegration of an occluding thrombus.

Capillary Oozing.—A certain amount of capillary bleeding is bound to occur when extensive adhesions have been separated, and although the hemorrhage usually ceases spontaneously, at times it persists in sufficient amount to require treatment. Just to what extent this bleeding should be checked must be left to the discretion of the operator. The more actively bleeding areas should invariably be controlled with mattress sutures; for the less active ones, and for those in such a position that the application of sutures is impracticable or dangerous, compression for a few minutes with a sponge wrung out of very hot water will often suffice. In doubtful cases a safe plan is to use a gauze pack for twenty-four hours; the objections to this plan are, however, as numerous as to drains in general. Nevertheless, if the oozing is free, a pack may be necessary. In the less marked cases, if it is certain that the main vessels have been tied securely, the oozing may be disregarded, the operator being justified in believing that a clot will form and the hemorrhage cease within a reasonable time. Occasionally, even under such circumstances it will continue, and a considerable amount of blood accumulate in Douglas' pouch; here it may be absorbed or encapsulated (hematocele). These cases do not, however, present the alarming symptoms of a secondary hemorrhage; very often, unless infection occurs, a slight increase in the pulse-rate being the only early symptom, and those attending the formation of a hematocele the only late ones.

Venous and Arterial Hemorrhage.—Venous and arterial hemorrhage is usually the result of the slipping, breaking, or premature absorption of a ligature. The most frequent cause of hemorrhage of this form is the tying of vessels or pedicles *en masse* and cutting too close to the ligature. If the pedicle is on tension, the straining incident to post-operative vomiting may release it from the grasp of the ligature. To avoid such a catastrophe, it is advisable to tie all large vessels individually in their course, or when tying *en masse* to transfix the stump, tie both ways, and leave the stump at least a centimeter in length and free of any tension. If catgut is selected as the ligature material, a gut that is not absorbed in less than ten days should be used, and all large vessels, such as the uterine and the ovarian, should be doubly secured. If silk is used, one ligature usually is sufficient, but in case of doubt, an additional one of catgut may be tied.

Hemorrhage from cervical or vaginal wounds occasionally occurs as late as ten days or two weeks following operation, after absorption of the catgut, which either releases an arterial or a venous trunk or permits the separation of two surfaces, as, *e.g.*, the lips of the cervix, whose vessels have been controlled by close approximation. Even when this occurs, if infection has not taken place, hemorrhage is unlikely to ensue. A vessel that has been secured successfully by an aseptic ligature is soon occluded by an obliterating aneuritis, or by an aseptic blood-clot that undergoes organization within a short time, so that absorption of the ligature after ten days under normal conditions would make no difference. If, however, there has been an infection, or if the inner coats of the vessel beyond the point of ligation have been injured by compression, the obliteration is delayed or an infected clot is formed that is prone to undergo disintegration and to be discharged from the vessel, thus promoting hemorrhage.

Hemorrhage after plastic operations is usually limited and readily controlled. Occasionally, because of the extensive loss of blood, the hemorrhage may give rise to alarming symptoms, and owing to the narrowing of the vaginal introitus, the bleeding area may be hard to expose and the hemorrhage difficult to stop. If simple packing does not suffice, the patient should be placed in the lithotomy position, an anæsthetic administered if need be, the parts freely and carefully exposed and illuminated, and additional sutures introduced to catch the bleeding points.

Hemorrhage of the grave and serious type occurs **from operative areas within the pelvis** where the bleeding cannot be seen, and the general symptoms are the only indication. Such hemorrhage may vary from an exceedingly rapid type in which the patient dies within thirty minutes, to those in which the loss of blood is less rapid and the patient succumbs in the course of hours, or in the event of alternate clotting, and renewed bleeding in the course of days.

Symptoms.—The most striking symptoms of this complication are a sudden increase in the pulse-rate, with diminished volume, and a subnormal temperature. The patient may complain of severe pain at the site of the bleeding vessel. The face is pale and anxious, the respirations are hurried, and in severe cases the auxiliary muscles are called into play. The mind is clear, but the speech is hurried and broken, and the patient is restless. If the bleeding continues the pulse becomes imperceptible at the wrist; the skin is cold and clammy, the dyspnoea is marked, consciousness is lost, the pupils dilate, and death finally ensues.

Diagnosis.—The symptoms are those of shock, already described (see page 671). Shock from hemorrhage and shock from other causes have few points of differentiation. Many cases of serious shock are in reality instances of hemorrhage. In true shock there is an accumulation of most of the blood in the splanchnic vessels. Whether or not hemorrhage is actually taking place may be judged best by the nature of the operation that has been performed, the care exercised, and the difficulty experienced in securing hæmostasis. Other factors, such as the general condition of the

patient previous to operation, the duration of the anæsthesia, and the amount of traumatism and exposure of the viscera, must also be taken into account, and will usually assist the examiner in reaching a correct diagnosis. Certain rapid cases of peritonitis may show symptoms closely resembling those of serious internal hemorrhage, but in the former there is usually a slight elevation of temperature and other signs, such as diminished peristalsis, which serve to distinguish between the two conditions.

The appearance of the subcutaneous blood-vessels may help to distinguish between a rapid, feeble pulse due to internal hemorrhage and one due to other causes. If the blood-vessels on the back of the hand, upon the forearm, at the bend of the elbow, and on the temples are well filled, it is unlikely that serious loss of blood has taken place.

An estimation of the hæmoglobin or a red and white blood count may also form a basis for differentiation. With a severe internal hemorrhage, all constituents except the leucocytes are greatly diminished; in the presence of sepsis, there is no marked change in the hæmoglobin and the red cells, but the white cells are increased in number.

Treatment.—The treatment of internal hemorrhage is that previously advised for shock, plus prompt ligation of the bleeding vessel or vessels. Cases of internal hemorrhage of moderate degree undoubtedly occur in which absolute rest and quiet, with gentle stimulation, will tide the patient over the critical period and the bleeding will cease; the attainment of so fortunate a result is never certain, and if the symptoms are marked and the diagnosis is reasonably positive, prompt action must be taken to secure the bleeding vessels. The patient should, with as little disturbance as possible, be placed upon an operating table, an anæsthetic administered, the dressings removed, the wound opened, and the pelvis well exposed, so as to learn, with the least possible delay, the source of the hemorrhage. If the continuous bleeding makes it manifestly impossible to expose the operative area quickly, clamps may at once be applied by the sense of touch alone, upon the uterine, ovarian, and round ligament vessels on each side. If the patient is in a desperate condition and the bleeding point is situated deep in the pelvis, as after a total hysterectomy, the pelvis may be packed with gauze, a firm pack placed in the vagina, and suprapubic and perineal counter-pressure may be maintained for a time until clots have had time to form. This may be of no avail in the case of a spurting artery, but will often be useful in venous hemorrhage or in oozing. The intravenous injection of horse serum may be tried.

Stimulation in a case of internal hemorrhage should be postponed until the bleeding vessel is caught (see also Extrauterine Pregnancy, page 373).

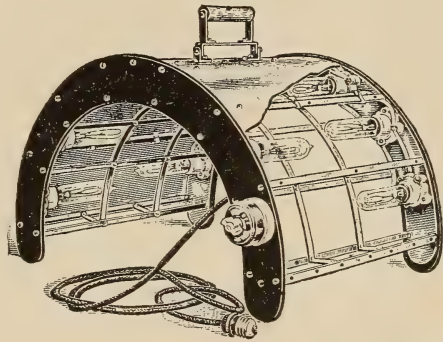


FIG. 498.—Portable heat cabinet, useful in treatment of pelvic inflammatory disease.

EXCESSIVE NAUSEA AND VOMITING

Etiology.—Nausea and vomiting are common after anæsthesia, but usually subside gradually within the first twenty-four hours. Occasionally they persist in an aggravated form for a much longer period, giving rise to considerable apprehension that all is not going well with the patient and that peritonitis or obstruction is impending. Although these symptoms may actually be due to an incipient peritonitis that undergoes resolution, or to a partial slight obstruction that is subsequently relieved, they are apparently frequently due to a hypersusceptibility on the part of the patient toward emesis, and a marked aversion to ether or to the anæsthetic that has been used. Nausea and vomiting have been ascribed to an increased action of the ether on the vomiting center in the medulla, or to an excess of mucus, which becomes impregnated with ether and is swallowed, giving rise to irritation of the gastric mucosa.

Treatment.—As exaggerated nausea and vomiting may be an indication of serious post-operative disorders, such as acidosis or acute gastric dilatation, peritonitis, or obstruction, the following measures may be employed until the diagnosis is clear: Ice-bags should be placed upon the lower abdomen; the patient should be kept in the Fowler position. If the abdomen is distended, a simple enema may be given. When the distention involves the upper abdomen especially, the stomach-tube should be passed and lavage practised. The urine should be examined for acetone and diacetic acid, and if either is present, sodium bicarbonate, 10 grains, should be given by mouth every three hours, or continuous enteroclysis with a 2 per cent. solution should be used. In desperate cases the intravenous injection of one pint of a 1 per cent. solution of sodium bicarbonate should be employed.

Regardless of all treatment, and without the development of any serious disturbance, the vomiting may continue. Under such circumstances the plan previously outlined should be followed until the symptoms subside. Nothing should be given by the mouth except sufficient water to control the thirst.

TYMPANITES

Etiology.—Extreme distention may be an indication of peritonitis, obstruction, or acute gastric dilatation. It may be the result of a transient paralysis of the bowel following operations in which the intestine has been considerably handled, or it may result from chronic gastritis or enteritis, plus incomplete evacuation of the intestinal tract before operation, and subsequent fermentation. There is usually recurring colicky abdominal pain (gas-pains). The condition may be accompanied by other disturbing symptoms, such as increased pulse-rate, elevation of temperature, and nausea and vomiting, or it may exist alone.

Treatment.—If peristalsis is normal, the distention may be regarded with equanimity, as it will usually be relieved promptly by a high compound enema and the application of heat to the abdomen. If violent peristalsis is present, so as to be audible to those about the patient, obstruction is quite possible, and the case assumes a more serious aspect, especially if other indications of obstruction, such as nausea and vomiting, are present.

The complete absence of peristalsis is almost invariably an ominous sign, and often indicates peritonitis, but here again the pulse and temperature must be taken into account. Faint peristaltic sounds may point to a transient post-operative paresis of the bowel.

The treatment of simple tympanites consists in the application of heat to the abdomen, and the use of rectal suppositories of asafetida (5 grains) every three hours. If flatus is not soon expelled, a simple enema of soapy water (1 pint) may be given; later, if necessary, an enema composed of epsom salts (2 ounces), glycerine (2 ounces), sweet oil (4 ounces), and water (2 pints) should be injected through a soft rectal tube passed high up into the bowel. Occasionally if the rectal tube is left *in situ* this will result in the passage of gas. An enema of pure glycerine or of alum (1 dram to 1 pint) or the milk of asafetida (1 ounce to 1 pint) may be effectual.

Various drugs have been recommended; of these the best is pituitary extract (pituitrin, 1 c.c.) given hypodermically. Eserine (gr. 1/60) and atropin (gr. 1/150) every three hours are recommended by some clinicians. The use of cathartics is unwise. The patient should receive practically nothing by the mouth if the thirst can be controlled with saline enemas, about 8 ounces every three or four hours. This has also frequently a beneficent effect on peristalsis and on the expulsion of gas.

PERITONITIS

Etiology and Pathology.—Peritonitis following operation is caused by the deposit of infectious organisms in the peritoneal cavity during the surgical procedure. These organisms may be carried on the hands of the operator or of his assistants, or be transmitted on the sutures, dressings, water, and other materials used in the operation, or they may come from foci of infection in the patient which have been invaded and liberated during the course of the operative procedure.

Peritonitis may be limited in its extent and localized to a particular region, or be unlimited and diffuse.

Following almost every operation there is more or less inflammatory reaction in the operative area, due chiefly to the mechanical insults to which the parts have been subjected. This quickly subsides, and does not give rise to constant or serious symptoms. When infection is added to the trauma, a bacterial invasion of the peritoneal surface takes place, with the formation of inflammatory products and the production of certain clinical manifestations.

The inflammation of the peritoneum becomes limited or unlimited, according to the virulence of the infecting organism, the resistance of the patient, the treatment employed, and the mechanical factors predisposing to one or the other. Thus, for example, a streptococcus infection is more apt to spread throughout the peritoneal cavity than is one that is caused by the gonococcus or the colon bacillus. Pelvic infections are more likely to remain localized than are those occurring above the brim of the pelvis, since the location and the surroundings of the pelvis favor localization to that area; furthermore, the Fowler position, the application of cold, the avoidance of cathartics, and the use of opiates will arrest peristalsis and be con-

ducive to localization, whereas the horizontal position, cathartics, and the omission of the local application and the opiate will favor peristaltic movement of the intestines, extension of the infection, and generalization of the inflammatory process.

The gross appearances of the peritoneal cavity at operation or post-mortem have led to various classifications of peritonitis; these are both unnecessary and arbitrary, so far as the clinician is concerned. The morbid changes that take place depend upon the nature and virulence of the infecting organism, the resistance of the patient, the duration of the disease, and the peculiar circumstances of the case.

Certain infections are of so virulent a type that the patient succumbs before marked changes take place in the peritoneum; others are so slow that any of the various stages of inflammation, effusion, lymph-formation and exudate, and finally pus formation may be observed. In some of the violent and fulminating types following operation, the peritoneal cavity contains only bloody serum with a few flakes of lymph, although the serous membrane itself has lost its clear, translucent appearance, is injected and red, and the intestines are distended with gas. When a later stage is reached, the intestinal coils are covered with flakes and patches of lymph that adhere closely, neighboring coils are more or less bound together with the plastic lymph, the fluid is a cloudy gray, less bloody than at first, and smaller in amount. To this succeeds the purulent stage, when the lymph is replaced by pus, the peritoneal fluid is purulent, the intestines are covered with a yellowish, adherent, membranous deposit, and many adjacent loops are closely matted and bound together, surrounding pools of purulent material. All these manifestations may be more pronounced in the area where the infection has begun, gradually diminishing the deeper one looks into the peritoneal cavity. Indeed, a peritonitis involving every part of the peritoneal cavity is somewhat rare, except in the very latest stages. In the rapidly fatal forms the patient is killed by toxins before there is any attempt at localization, such as a matting together of the intestinal loops by lymph always indicates.

Any peritonitis, even though it threatens to become general, may, with proper treatment, if taken in time, become localized. If the toxic products are but moderately poisonous; if the resistance of the patient is good; if the intestinal coats have not been damaged beyond repair, and the integrity of the intestinal tube is not destroyed by adhesions and inflammatory deposits, the general condition of the patient may gradually improve as the pus becomes localized and the disease confines itself to a certain area.

Symptoms.—The symptoms of peritonitis are many and varied. No one of them alone is a certain indication of the disease, and it is only by a combination of several that a conclusion can be reached. Increase of the pulse-rate, elevation of temperature, intestinal paresis, tympanites, nausea, vomiting, and a peculiar facies make up the symptom-complex. In the early stages rapidity of the pulse and a limitation or an abrogation of intestinal peristalsis are the most significant symptoms. The temperature is usually elevated to a point higher than is common in the normal post-operative convalescence (100°), and at times it is elevated to 103° or 104° F.

In some cases, however, the temperature is only moderately elevated until the patient is *in extremis*. The abdomen is distended and tense, the walls are rigid and spastic, and the patient complains of pain when the ear of the examiner or a stethoscope is applied to detect the peristaltic sounds. As a rule, these are greatly diminished or absent, and nothing is heard but the rapid beating of the abdominal aorta.

Enemas given for the relief of tympanites are usually ineffective, or but slightly successful; in any case, they fail to relieve the distention. The patient complains of nausea, and rejects anything given by the mouth from time to time. At first the stomach may show some tolerance, but this stage does not last long. Even if fluids are withheld, in the later stages there is vomiting of bile, and at length of fecal matter, which has been driven into the stomach from the distended and paretic small intestine.

The patient is toxic, feverish, restless, and presents the flushed cheeks and bright eyes that accompany an elevation of temperature. At first the mind may be clear, but it soon becomes confused; delirium, hiccough, and a semi-stuporous condition often supervene. The pulse becomes progressively faster (150 to 160) and weaker, later intermittent, and finally, imperceptible. The respiratory rate is proportionately increased.

The course of the case varies with the virulence of the infection, the extent of the lesion, and its complicating or associated conditions. A peritonitis engrafted upon an already shocked or acutely anæmic person is much more likely to spread quickly and end fatally than is one in which the opposite conditions prevail. So, too, if a partial obstruction of the intestinal tract coexists, the case will run a decidedly less favorable course than it would otherwise.

Perforation of the gut or leakage from a wounded ureter or bladder exerts a decidedly deleterious influence and makes resolution improbable and almost impossible. Leucocytosis is usually present, and except in very rapidly fatal cases, or in shocked or weakened individuals, it is high (20,000 to 40,000). The increase affects particularly the polymorphonuclear leucocytes (see Leucocytosis, page 106).

Diagnosis.—It is evident that other conditions may closely resemble a peritonitis in its incipient stage, or that these very conditions are due to a beginning peritonitis that subsides spontaneously or as the result of treatment. Thus, rapid pulse, high temperature, restlessness, tympanites, hiccough, absent or restricted peristalsis, and nausea and vomiting may each be entirely independent of peritoneal infection, and may yield to proper symptomatic treatment. It is only when these symptoms are associated, and persistently so, that a diagnosis of peritonitis can be positively made. In the advanced stages these symptoms are all present, but any one or a group of them may be the first indication of trouble.

The diagnosis must also be influenced by the nature of and the complications attendant on the preceding operation. If the procedure has been performed under favorable auspices, with good surroundings and proper technic; if no focus of infection has been invaded, and if there has been no intestinal trauma, peritonitis is, of course, unlikely to occur. If, on the other hand, a collection of pus has ruptured into the peritoneal cavity; if an

infected area has been invaded by the operator; if the intestine has been traumatized; if the operation has been prolonged, the amount of traumatism great, and the technic faulty, then peritonitis is more to be expected.

Treatment.—When there is more reason than usual to fear post-operative peritonitis, the case should immediately receive such treatment as will tend to localize the process, to eliminate the toxins, and to fortify the patient so that she may be able to resist the attack. To this end the head of the bed should be elevated at once, so as to favor, by gravity, the limitation of the condition to the pelvis or to the lower abdominal cavity. Ice-bags should be placed over the operative area, enteroclysis started, and the patient closely observed.

If symptoms of peritonitis appear, the treatment should be continued. An attempt may be made to relieve the distention by means of enemas, but if a simple and a high compound enema an hour apart are not provocative of results, there is nothing to be gained and much harm may result from a repetition of this treatment. If the pain is severe, if nausea and vomiting are pronounced, and if the patient is exceedingly apprehensive, morphine and atropin or heroin may be given with advantage. Liquids by the mouth must be restricted. Stimulants should be administered hypodermically, the main reliance being placed on strychnine, digitalis, and camphor. Whiskey, ammonium carbonate, or strong coffee may be given by the bowel. Champagne is at times well borne by the stomach.

The aim of the attendant must be to keep the infection limited by posture and the application of cold, and to avoid undue stimulation of the intestine, since an increase of peristalsis will almost undoubtedly spread the infection. Furthermore, it is of the greatest importance to supply fluids to the body (sodium chloride or sodium bicarbonate by enteroclysis) and to stimulate the patient in the hope that she may successfully resist the infection and overcome it. If the treatment seems to be unavailing and the process tends to grow worse, and it becomes evident that general involvement of the peritoneum has come about, there is nothing to be gained by an abdominal incision and the institution of drainage, for by this time the disease is so fully developed that better results are obtained by a continuance of the conservative plan.

INTESTINAL OBSTRUCTION

Etiology and Pathology.—Obstruction to the lumen of the intestines may be brought about in various ways; possibly the commonest is by the formation of an adhesion, between a loop of the gut and some part of the operative area, that constricts or kinks the intestine, or by the incarceration or strangulation of a loop of the bowel that has slipped through an opening bridged by adhesions. The essential feature of both forms is adhesions.

Obstruction may also occur as the result of the twisting of a loop of intestine on its mesentery, or the slipping of a loop through an adventitious opening in the omentum or mesentery. Occasionally obstruction is the result of a localized constriction of a part of the bowel from some unknown cause (*dynamic ileus*). Another form of so-called obstruction (*adynamic ileus*) is marked by extreme distention of the entire intestinal tract—a

paralysis of the bowel probably due to vasomotor or trophic disturbances, but the true nature of which is probably unknown.

Obstruction of the intestinal lumen may be complete or partial. It is rarely complete at first, but many incomplete cases become complete secondarily, by reason of swelling and thickening of the intestinal coat at the point of constriction incident to secondary peritonitis and invasion of the intestinal wall, distention of the gut above the obstructed point, and kinking. The obstruction to the passage of the gas and faeces results in an increase of the peristaltic action of the bowel above the obstructed point. This usually serves only to increase the constriction of the lumen, and results in distention of the bowel, impairment of its circulation, and invasion of its walls by bacteria. If a loop of bowel has slipped beneath a band of adhesions or a rent in the mesentery or omentum and becomes constricted, its circulation may be so completely shut off that it rapidly loses its vitality and becomes gangrenous.

The intestinal contents above the point of obstruction soon become extremely toxic, give off a more or less sour, offensive odor, and the intestinal walls show hemorrhagic infarcts. After a time invasion of the intestinal wall by bacteria becomes so marked that peritonitis ensues. The bowel above the site of obstruction becomes more and more distended, until, in an effort to empty itself, the peristaltic action of the intestines is reversed, and the intestinal contents is driven back into the stomach.

Intestinal obstruction may develop within a few hours of, or several weeks after, an operation. It is usually sudden in onset, and the symptoms become rapidly more severe unless the lumen of the intestine is restored by operation. Intestinal obstruction is one of the most frequently fatal post-operative complications.

Symptoms.—The symptoms of obstruction are pain, nausea and vomiting, tympanites, violent peristalsis, and obstipation. (In adynamic ileus there is no peristalsis, but the condition is more a paresis than an obstruction of the intestine.) The pain is violent, sharp, and agonizing, and is usually referred to the affected area, but it may be reflected to a considerable distance. Obstipation rarely appears at once. As a rule, a stool, and possibly the passage of considerable flatus may be secured by means of enemas. Nevertheless, the movement is not quite satisfactory in that it is not free, and does not relieve the pain or the distention.

Peristalsis is generally marked—so much so that it may be noticed by the patient, and be distinctly heard by the attendants. Nausea and vomiting are common symptoms, appearing earlier and being more severe when the obstruction is high, and coming on late and being less severe, except in the later stage, when the obstruction is low.

There is usually but little elevation of temperature until the later stages, when peritonitis has supervened or the patient has become decidedly toxic. Almost from the first the pulse is increased in frequency. As the disease progresses, all the symptoms except the pain become intensified. With the onset of structural changes in the intestines pain is complained of less and less, until finally the patient may express herself as being comfortable. This is an ominous symptom and usually indicates a gangrenous condition. In-

testinal paresis, absence of peristalsis, and extreme distention follow. The vomiting is persistent, and takes the form more of a regurgitation than of an actual ejection, being dependent somewhat upon the intake by the mouth at first; soon, however, it becomes almost continuous and independent of food or drink. Early in the disease the vomitus consists of the fluid taken into the stomach mixed with bile and mucus; later it is made up of the acid, sour, foul-smelling contents of the small intestine, and finally of liquid fecal matter.

In the earlier stages of obstruction the mind is clear, and the patient is apprehensive regarding her condition. In the later stages the mind is dulled, the talk is rambling, and finally, semi-consciousness or stupor supervene.

Diagnosis.—It is at times difficult to distinguish between intestinal obstruction in the early stages and peritonitis. In the late stages of both conditions the one is associated with the other, and, of course, no differentiation can be made. In the early stage of obstruction sharp pain, increased peristalsis, abdominal distention, recurrent vomiting, absolute or partial constipation, with normal or but slightly elevated temperature and pulse-rate, are characteristic. Attempts to move the bowels by enema may be partly successful, but are never altogether satisfactory, the distention is unrelieved, and the symptoms persist.

Treatment.—The treatment of intestinal obstruction must be prompt if it is to be of any benefit. As soon as the diagnosis is made, surgical intervention is demanded. If the condition is strongly suspected and palliative measures afford no relief, an exploratory operation is justifiable. Since other conditions of a much less serious nature may resemble the early stage of an obstruction, palliative measures should be employed at first in the hope that they will give relief. Thus, enemas may be given to relieve distention; lavage may be employed to empty and cleanse the irritable stomach; hot stupes or poultices may be applied to the abdomen to favor the expulsion of gas. In actual obstruction, however, none of these measures will give relief, and it is then that surgery must be invoked.

It can scarcely be too strongly urged that in a *suspected* case of intestinal obstruction *cathartics* must be carefully avoided. Nothing has a more unfavorable influence upon an obstructed bowel than the increase in fluid contents and the forcible peristalsis occasioned by the use of a cathartic. In cases of suspected obstruction the administration of a purgative will often clear up all doubt as to the nature of the lesion, and if the symptoms were not due to obstruction, they will disappear as if by magic. Nevertheless, under such conditions the patient would ultimately have been relieved without the aid of a purgative. On the other hand, if an obstruction had been present, the administration of a cathartic, by increasing the injury to the intestine itself, might have rendered the case hopeless. It is evident, therefore, that in cases of suspected obstruction *purgatives by the mouth* are *unnecessary and dangerous*.

What surgical procedure should be employed? Nowhere in surgery more than in these cases is experience the mother of wisdom. As soon as it has been decided that surgical interference is required, all preparations for carrying out a rapid abdominal section should be made. All the instru-

ments should be at hand, the needles threaded, and the ligatures ready before anæsthesia is begun. Forceps for intestinal anastomosis, Murphy buttons, and Paul's tubes must be provided.

Nitrous oxide-oxygen, and ether anæsthesia or local anæsthesia should be used. If the original incision is clean and in the median line, it may be reopened; otherwise, the new incision may be made to one side of, above, or below the original incision. It should be made, by preference, in the median line. According to Moynihan, the most distended part of the intestine or that directly above the point of constriction, will usually float higher than the remainder and be in the median line, so that the loop that first presents itself may be caught up and followed for a short distance below and above, in an attempt to locate the obstruction. If this plan reveals nothing, the hand may be passed to certain points where, from the nature of the operation, adhesions would be most likely to have formed, or to those areas, as, *e.g.*, the ileocæcal junction and the hernial rings, where obstruction from other causes is most prone to occur. Nothing being found, the loop that is most distended should again be picked up and followed systematically downward until the point of obstruction is discovered.

As the intestine is followed in this way the portion that has been inspected may be pushed into the upper abdomen, or if distention is so great as to render that plan impracticable, the loops of gut should be surrounded by gauze pads saturated with hot salt solution. Evisceration should, if possible, be avoided.

After the point of obstruction is located, the existing conditions will determine the course to be pursued. The bowel may be in such good condition that apparently nothing more than the relief of the obstruction will be required. On the other hand, it may at once be evident that resection of a badly diseased or gangrenous intestine is imperative. Whatever operation is contemplated, unless the patient's condition is so alarming that nothing beyond an enterostomy dare be attempted, the dilated and distended part of the intestine, especially if the obstruction is high, should be emptied by means of a glass tube, after the method of Moynihan.

The bowel should be opened in the center of an area about which a circular suture has been introduced. The incision should be made in the long axis of the bowel, and the intestine above and below the point clamped or compressed so as to prevent the escape of fluids or gas. The free end of the glass tube, with a rubber hose attached for drainage, should then be introduced, and the suture tied so as effectually to control any tendency to leakage from the intestine. The clamps are removed and the tube is then pushed further into the intestine, evacuating loop after loop of the bowel as it is threaded, so to speak, upon the glass tube.

After the tube has been covered with as much of the bowel as it will hold, the tube may be removed, the opening closed by suture, and the process repeated at a higher point. The latter is rarely required, however, and should not be attempted if it can be avoided. It is of marked advantage thus to rid the bowel of the fluid contents, which is often highly toxic and exposes the patient to great danger, even though the obstruction is

overcome. After emptying the bowel, the resection and anastomosis may be carried out *secundum artem*.

If the condition of the patient is so grave that any extensive procedure is inadvisable, or if, although the immediate obstruction is overcome, it is likely to recur, or if so large a part of the intestine is involved in adhesions that resection would be exceedingly dangerous, one of two plans may be adopted: either a short-circuiting operation may be performed or Paul's tubes may be introduced for drainage. The first is applicable only to cases of obstruction of the small intestine fairly low down; here a rapid lateral anastomosis with clamp and suture or a Murphy button applied to the gut above the sigmoid flexure, may be a life-saving measure.

In extremely desperate cases, with marked distention, when the intestine is in badly diseased condition and the patient is so weak as to preclude any but the most rapid operation, a loop of the bowel may be pulled out of the incision and fixed there, the peritoneal cavity being excluded with a running catgut suture; in the course of several hours it may be opened, and a Paul's tube inserted into each limb of the loop. This provides drainage if any peristaltic activity of the gut remains, and may tide the patient over until an operation for the relief of the obstruction and the restoration of the integrity of the intestinal canal can be undertaken.

In cases of **dynamic** or **adynamic** ileus but little can be accomplished. Neither condition is clearly understood, and those cases that have come to operation have usually been unsuccessful. Adynamic ileus is possibly a form of paralysis of the intestine due to injury of the motor nerves that supply it. This injury is believed in some cases to have been due to excessive or rough handling of the intestines, as in making a thorough exploration of the abdomen, or exerting too much pressure upon the bowel with gauze pads in walling-off an area from the seat of operation. Dynamic ileus is a strange condition that in some cases is inexplicable. In some of the reported cases the curiously localized contraction of a few inches or more of the intestine may have been a post-mortem change.

ACUTE GASTRIC DILATATION

Etiology and Pathology.—Acute gastric dilatation is one of the rare complications following operation. The condition usually occurs after operations for disorders of an inflammatory nature, but not necessarily in the upper abdomen. There is commonly an obstruction of the duodenum at the point where it is crossed by the superior mesenteric artery, so that the condition has been attributed to a dislocation downward of the stomach with a drag on the duodenum. The obstruction is not always primary, but may be secondary to a marked relaxation or atony the result of paresis of the gastric motor nerves, which gives rise to an enormous dilatation of the stomach and a kink in the neighboring duodenum.

Symptoms.—The symptoms of acute gastric dilatation are extreme distention of the upper abdomen, epigastric distress, persistent nausea, profuse vomiting, rapid pulse, and prostration. The condition is troublesome, dangerous, and usually persists in spite of treatment.

Diagnosis.—The diagnosis may be confirmed by passing a stomach-tube, when a considerable quantity of gas and fluid will be evacuated.

Treatment.—The treatment consists in repeated emptying of the stomach by means of a stomach-tube, washing with salt or soda solution, leaving a portion of the fluid in the stomach, and placing of the patient in the left latero-prone or Sims' position. The injection, hypodermically, of extract of pituitary gland has been recommended because of its stimulating action on the smooth muscle-fibers.

In the repeated lavage which is necessary it has been found useful to pass a duodenal tube with a weighted end into the stomach, fixing the free distal end outside of the mouth. The presence of the tube in the œsoph-

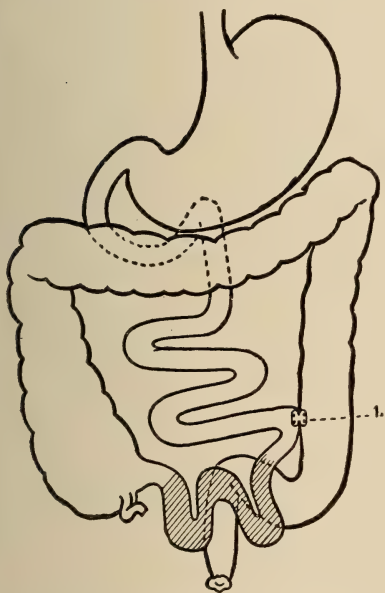


FIG. 499.—Short circuiting for intestinal obstruction, ileo-sigmoidostomy, diagrammatic.

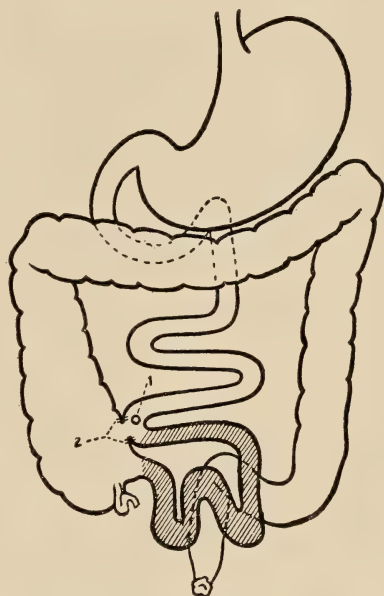


FIG. 500.—Short circuiting for intestinal obstruction, ileo-colostomy, diagrammatic.

agus does not give rise to much annoyance, and relieves the patient of the disagreeable necessity of repeated passage of the stomach-tube. For the same reason it has been suggested that the proximal end of the stomach-tube be brought out through the pharynx, posterior nares, and one nostril, and fastened *in situ*.

BRONCHITIS

Etiology.—Bronchitis is one of the most frequent pulmonary complications that follow operation. It is a common sequel to etherization when the patient at the time has a rhinitis, pharyngitis, or tracheitis. In order to avoid this complication operations should be postponed, when possible, until acute affections of the nose and throat have entirely cleared up. Bronchitis may be the result also of prolonged etherization or of exposure during the operation.

Symptoms.—Post-operative bronchitis manifests the same symptoms and runs the same course as other forms of bronchitis. The frequent cough, the accumulation of mucus in the throat, the increased respiratory rate, etc., all tend considerably to increase the post-operative discomfort.

Treatment.—The treatment of post-operative bronchitis differs in no way from the treatment of bronchitis in general. The patient should be placed in the Fowler position. Counter-irritation with mustard should be employed, and heroin prescribed for the cough. If any other medication is considered advisable, Brown's mixture (1 to 4 drams) with 5 to 10 grains of ammonium chloride, may be added.

PLEURISY

Pathology and Treatment.—Well-marked pleurisy following operation is usually associated with pneumonia or with an acute exacerbation of a tuberculous process. Severe pain in the chest, with a pleuritic friction-rub and pyrexia, apparently independent of pneumonia or tuberculous processes, is not infrequently observed. These symptoms, as a rule, are promptly relieved by strapping and the administration of the salicylates. The condition subsides within a few days. Miller points out that many of these cases are secondary to small hemorrhagic infarcts in the lungs, which result from minute emboli; phlebitis may appear later in the course of the convalescence.

NEPHRITIS

Etiology and Prophylaxis.—Nephritis as a post-operative complication is a rare occurrence when the patient has been properly prepared for operation. In order to avoid nephritis, a careful examination of the urine before operation and an estimation of the total quantity eliminated should be made, and suitable measures instituted to correct any abnormalities. When the symptoms of kidney insufficiency persist in spite of treatment, the patient should not be given ether or chloroform. Nitrous oxide and oxygen, or, preferably, local or spinal anæsthesia, should be employed instead.

The routine practice of throwing one or two liters of sterile tap water, 2 per cent. soda bicarbonate solution, or salt solution into the bowel before the patient leaves the operating table, or of administering from 8 to 16 ounces every three hours, will do much to alleviate the renal irritation which ether produces, even in healthy kidneys, and act as a prophylactic. When nephritis is especially feared, sodium bicarbonate (2 per cent.) solution or tap water should be used instead of salt solution, which is said to be less favorable in its influence.

In a large proportion of cases casts and albumin may appear in the urine during the first twenty-four to thirty-six hours following operation, but this may be regarded merely as the result of irritation of the renal structure—*i.e.*, a mechanical or chemical irritation, which is transient in character, and not a real hazard to the patient. Actual nephritis must be dealt with in the customary manner, as when it occurs under other circumstances.

SUPPRESSION OF URINE FROM URETERAL OBSTRUCTION

Etiology and Symptoms.—In panhysterectomy for cancer or cervical myomata, in difficult supravaginal hysteromyomectomies, in hysterectomy for densely adherent adnexa, or intraligamentous cysts, the ureters may be exposed to the risk of injury. This risk is lessened by constant orientation of the ureters during the course of the operation, whether they are actually exposed by dissection or not. In spite of these precautions, the surgeon may feel anxious about them after operations which have been unusually difficult.

A diminution in the excretion of urine after operation is to be expected. Usually less than 24 ounces are excreted during the first twenty-four hours. The decrease in the total amount is less marked when soda bicarbonate or salt solution or tap water is given at the close of the operation or immediately thereafter. If, in spite of enteroclysis or hypodermoclysis, the excretion of urine remains much diminished—1 to 8 ounces in twenty-four hours—there are two possibilities, at least; either suppression of the kidney function or an injury or accident that occludes the ureters.

Diagnosis.—Suppression of the kidney function may be due to a decided fall in blood-pressure which sometimes takes place when a large amount of blood has been lost during the operation. An estimation of the blood-pressure will clear up this point. Suppression of the urinary function from nephritis is not likely to be absolute; the urine which collects in the bladder contains albumin and casts, and the general symptoms of nephritis (uræmia, œdema, changes in the eye-grounds, etc.) are present. When the anuria is absolute or nearly so, for more than twenty-four hours, and the associated symptoms do not clearly point to a nephritis, it is desirable to determine at once whether any injury has been inflicted on the ureters. The only way to settle this question is by introducing a cystoscope into the bladder and catheterizing the ureters. If, on exposing the ureteral orifices, the examiner is rewarded by observing the ejection of urine from each, he need look no further unless the question of partial obstruction on one or on both sides must be decided. When the orifices are quiet, each ureter should be catheterized.

If the catheter passes easily it signifies that the ureters are patulous; when an obstruction is found on one or both sides, it is almost invariably close to the bladder, within 5 cm. of the ureteral orifice. An obstruction more than 10 cm. from the bladder may indicate a constricting ligature at that point, but it may also be due to a distortion or kinking of the ureter at the pelvic brim, which prevents the passage of the smallest catheter.

Treatment.—If absolute or nearly absolute obstruction is actually present on both sides, the only hope for the patient lies in immediate operation. Ureteral catheters should be introduced as far as they will go on each side, and the incision should be opened under nitrous oxide-oxygen-ether anæsthesia; the operative area should be exposed, and the ureters examined. This may be facilitated if the catheters are left *in situ*; furthermore, the ureters may be distended above the point of obstruction and thus be readily located by palpation; if this is not done, they must be deliberately sought for and dissected, as in the operation of panhysterectomy.

When the point of obstruction is found, the constricting ligatures should be removed. If the ureteral wall or sheath has not been injured, this maneuver will be sufficient to restore its function. When the wall or sheath has been bruised or torn and necrosis threatens, the ureter should be divided above the injured area, the distal end ligated and cauterized, and the proximal end implanted into the bladder. If the proximal end will not reach the bladder, it should be implanted into the rectum or the sigmoid.

If the ureter on one side has been easily freed; if a minimum amount of damage has been done and the kidney on that side is in good condition, in desperate cases, where haste is urgent, the other ureter may be ligated.

If both kidneys are involved by accidental ligation, the release of the ureters is demanded in order to save the patient's life. In serious cases of complete suppression from bilateral ureteral obstruction, lumbar nephrotomy may be performed to tide the patient over for a time.

Ligation of one ureter, the other remaining undisturbed, with a healthy kidney on the good side, does not result in any marked reduction in the urinary output nor in symptoms of uræmia. Usually the patient will complain for several days of a severe pain in the loin of the affected side, with tenderness, but without perceptible enlargement of the affected kidney. The pain may disappear entirely in the course of a few days, and no subsequent symptoms develop, so that the condition may remain unrecognized.

If occlusion of the ureter is not absolute and the kidney continues to functionate, the symptoms of pyelitis, hydroureter, and hydronephrosis gradually develop, and make the diagnosis clear.

A ligature passed about the ureter may so injure its sheath and nutrient blood supply that gangrene sets in; the urine escapes and infiltrates the tissues, producing a cellulitis with the formation of pus, which discharges externally, either through the cervical stump, the vaginal incision, or the abdominal incision. This is the most frequently recognized result of ligation or other injury to the ureters during operation.

Bilateral ligation or obstruction of the ureters incident to operation is fortunately rare, and will continue so if the operator bears constantly in mind the exact position of the ureters and guards against injuring them, or, if they are necessarily in the operative field, as in panhysterectomy, he exposes them deliberately to sight and touch (see page 349).

PHLEBITIS

Etiology and Pathology.—Phlebitis is one of the most annoying and troublesome post-operative complications. It may follow the simplest aseptic abdominal section. It rarely, and practically never, occurs after plastic operations and those performed by the vaginal route. Its occurrence has been ascribed to infection and to injuries (puncture, contusion) of the deep epigastric veins, especially in anæmic patients.

The most frequent causes seem to be injury of the deep epigastric veins as the result of forcible or prolonged retraction of the abdominal incision (Clark), anæmia, circulatory weakness, and the restriction of motion following a celiotomy.

Puncture or bruising of the deep epigastric veins may occur during the process of making or of closing the abdominal incision. Injury of the pelvic veins may give rise to phlebitis of the broad ligament, a condition that is often unrecognized. There may or may not be œdema of the lower extremities. To all traumatic causes may be added the hæmolytic action of bacteria; these usually are so feebly virulent or are present in such small numbers as to produce no gross infection.

Phlebitis is occasionally a precursor of embolism and minute emboli from the site of operation may produce pulmonary infarcts and localized patches of pneumonia or pleurisy before the symptoms of thrombophlebitis appear (see Pleurisy, page 685). Post-operative thrombophlebitis usually affects the femoral veins, and is more frequent on the left than on the right side. The process apparently begins in the deep epigastric vein, and extends to the point of its junction with the femoral vein above Poupart's ligament. Here the walls of the vein are more or less fixed by the surrounding fascia, and the smaller volume of venous blood being poured into the larger vessel from the epigastrics is believed to result in a sort of whirling motion (*wirbelbewegung*) of the blood at this point; the flow of blood is retarded, a thrombus forms, the vein becomes partly or wholly occluded, and the walls become irritated and inflamed.

Symptoms.—The earliest symptoms of phlebitis (embolic pleurisy may have been observed in the first post-operative days) are rapid pulse, increasing in periodic waves, and unaccompanied by a corresponding rise in the temperature; later there are slight elevation of temperature, pain and tenderness in the calf or along the course of the femoral vein, and œdema of the affected extremity. These symptoms all vary in degree, and occupy a more or less prominent place in the symptom-complex.

Treatment.—The treatment consists in elevating the affected limb and in applying ice to the calf and the groin. At a later stage, after the acute symptoms have subsided, a fly-blister may be put over the line of the femoral vein below Poupart's ligament. The leg should be wrapped in cotton and snugly bandaged. Elevation should be maintained until œdema over the tibia and about the ankle has subsided. The limb should not be used until the induration, tenderness, and œdema have disappeared and the temperature and pulse are normal. Massage should be prohibited for from four to six weeks afterward. The use of the limb should be gradually increased, and a recurrence of the symptoms, even in the slightest degree, should be regarded as an indication to resume the treatment by rest and elevation of the affected limb.

Before arising in the morning, a snug bandage of flannel or elastic crêpe should be applied, beginning at the bottom, encircling the foot, and reaching to the groin.

As has been stated, phlebitis is one of the most annoying and obstinate complications following operation. Even after prolonged rest and careful treatment full compensatory collateral circulation may not be established, the leg thus remaining more or less disabled, and becoming swollen when any unusual exertion is undertaken.

PULMONARY EMBOLISM

Etiology.—Pulmonary embolism is one of the catastrophes that may follow any abdominal operation. It occurs particularly after hysterectomy for uterine myomata, and is probably explainable by the fact that anæmia and circulatory weakness are often found in myoma patients. In a large number of instances embolism follows simple appendicectomy or salpingo-oöphorectomy, so that it is by no means limited to any one type of operation. Altogether it is a rare complication, but it occurs so suddenly, often with no warning whatever, in patients who, up to the moment of seizure, have undergone an uncomplicated convalescence, that it must always be taken into account. The possibility of this complication alone makes the prognosis of celiotomy guarded.

Symptoms.—The symptoms usually come on without the slightest warning, or they may be preceded by those of embolic pneumonia, pleurisy, or thrombophlebitis; they consist of sudden dyspnœa, precordial distress, and increase of the pulse and the respiratory rate. Death quickly ensues. As a rule, pulmonary embolism takes place within a week or ten days after the operation—often when the patient sits up or gets out of bed for the first time. It is usually rapidly fatal, the embolic clot being of such a size as completely to block the pulmonary artery. Embolism may occur shortly after operation, within a few hours, or during the first post-operative days. Here, too, it may be rapidly fatal, but undoubtedly cases of embolism occur at this time in which the emboli are minute and death does not take place; the grave and alarming symptoms gradually subside, and are succeeded by those produced by infarcts in the peripheral distribution of the pulmonary artery. Miller believes that most cases of post-operative pneumonia are embolic in origin. To the sudden symptoms of embolus previously described, in the cases not immediately fatal there are added the symptoms of pulmonary infarction or embolic pneumonia, mild or severe in type, depending upon the size of the area that has been deprived of its blood supply.

Diagnosis.—In the fatal cases the condition may be mistaken for a rapid and profuse internal hemorrhage or an acute dilatation of the heart. Except for those occurring within a few hours of operation, these conditions hardly require consideration here. Internal hemorrhage is almost never so rapidly fatal, even immediately after operation, and certainly never after the tenth post-operative day. Acute dilatation of the heart may be suspected if the heart was affected at the beginning, and if the operation was prolonged and the patient was kept for a long time in the Trendelenburg position. As a rule, the symptoms of acute dilatation are not so sudden in onset. The subsequent course of the case will serve to clear up the diagnosis. In fatal cases only an autopsy will serve to make the diagnosis positive.

Prophylactic Treatment.—Thrombosis must, of course, precede embolism, although in the majority of these cases it gives no evidence of its existence, and is limited to the pelvis. Nevertheless, the causes of thrombosis must be eliminated in order to guard against embolism. To this end, in all celiotomies, care should be exercised lest a vein be contused or punctured. When, in spite of care, injury of a vein occurs and is recognized, the

affected area should be excluded from the circulation by ligating the vessel on one or both sides of the injured part.

A high Trendelenburg posture, with flexion of the knees, is to be avoided. Forcible and prolonged retraction should be guarded against in order to avoid thrombosis in the epigastric vessels. The treatment, after operation, of those patients in whom thrombosis and embolism are especially to be feared (*i.e.*, those suffering from uterine myoma, anæmia, or circulatory weakness) includes maintenance of the heart action and blood-pressure by continuous moderate stimulation, and by active and passive movements of the legs from the very beginning of convalescence. With these immediate post-operative measures, it is advisable to get the patient out of bed a little sooner than in the average case.

POST-OPERATIVE RENAL INFECTION

Etiology, Pathology, and Treatment.—Obscure and otherwise unaccountable elevation of temperature following operation may be due to a post-operative renal infection. The condition usually sets in some time after the operation, and may be preceded by cystitis or a focus of pus formation, such as a suppurating abdominal incision.

Many of the cases are really hematogenous infections due to the colon bacillus. The clinical picture of the milder forms is that of pyelitis, and the case responds readily to treatment (see p. 487).

More severe forms, due to the colon bacillus or the pyogenic cocci, have been observed. These are also hematogenous. The kidney is affected by a pyelonephritis. Some cases are rapidly fatal, and operative treatment may be required (see p. 473).

SUPPURATION OF THE INCISION

Etiology.—At the present day suppuration of the incision is rarely encountered. It may be caused by infection alone or infection combined with traumatism and devitalization of the tissues, imperfect hæmostasis, and accumulation of blood in the wound, etc.

Symptoms.—An active infection will manifest itself by marked pain and tenderness in the wound, with an unusual rise of temperature during the first post-operative days. Examination of the incision will reveal the usual signs of inflammation. Suppuration occurs rapidly. Separation of the margins of the incision results in the discharge of pus.

In the average case no active symptoms occur to direct the attention to the wound during the early days of the convalescence; but toward the end of the first week the temperature does not recede to the normal, to remain there permanently. About this time the incision may open spontaneously and discharge purulent or bloody fluid, or upon examination signs of inflammation and the presence of fluid beneath the skin will at once be apparent.

Treatment.—Free drainage of the suppurative area is essential to rapid healing and should be instituted without delay. Great care should be taken to avoid

extension of the infection to the deeper layers of the incision. The abscess cavity should not be cleansed by syringing, but by gentle pressure and sponging with moist pledgets of cotton. All manipulations must be very carefully carried out.

After free drainage is provided the application of heat will tend to hasten resolution. Later, granulating surfaces may be stimulated by silver nitrate or scarlet salve. Suitable strapping of the borders of the wound will hasten union.

LOCAL INFLAMMATION OR SUPPURATION IN THE PELVIS

Etiology, Symptoms, and Treatment.—Occasionally, following pelvic operations, there will be noted an elevation of temperature that persists beyond what may be termed the normal post-operative febrile period. Associated with this there may be lower abdominal or pelvic pain and soreness. Bimanual examination reveals the presence of induration and tenderness somewhere in the pelvis, varying with the nature of the operation and the degree of inflammation. The pelvic structures appear to be more or less fixed.

In many cases the actual condition is a localized peritonitis or cellulitis rather than an actual infection. It is the result of traumatism and devitalization of tissue from ligatures, sutures, etc.

As a rule, the application of heat to the lower abdomen, hot vaginal douches, and rest in bed result in a gradual amelioration of the symptoms. Occasionally, in the case of a hysterectomy, the symptoms subside suddenly after a discharge of purulent material through the cervix.

CYSTITIS

Post-operative cystitis is usually the result of frequent or unclean catheterization. (For **prophylaxis** see page 453; for **pathology** and **treatment** see page 454.)

POST-OPERATIVE CARDIAC DILATATION

Simpson has drawn attention to right-sided hypertension and occasional dilatation of the heart following operation. This observer reports that Wertheim had a death-rate of 4.4 per cent. from acute dilatation alone, following abdominal hysterectomy for cancer.

Etiology.—This post-operative complication is most likely to occur in patients who display the usual clinical evidences of a weakened myocardium, as well as those in whom the myocardium is believed to have been weakened by excessive business or social cares; hyperthyroidism, long-continued or very recent absorption of bacterial toxins (pneumococcus, streptococcus, diphtheria bacillus, etc.); biliary poisons; toxins from malignant neoplasms; marked or chronic anæmia, etc.

Prolonged anæsthesia, the Trendelenburg position, and the injection of large quantities of salt solution increase the burden of the heart and favor the occurrence of cardiac dilatation.

Symptoms.—The clinical picture of hypertension or beginning cardiac dilatation shows: An abrupt increase of the pulse-rate—20 or more beats—

slight cyanosis, sudden marked weakness, great apprehension, and an increased area of the right heart.

Treatment.—The treatment consists in elevating the *head* of the bed, the administration of morphine by hypodermic injection, and the cautious use of cardiac stimulants.

POST-OPERATIVE PAROTITIS

Parotitis may occur as an occasional complication during operative convalescence, usually appearing within the first week or ten days following operation. It occurs with much greater frequency (one observer claiming it appears ten times as often) after operations on the pelvic or abdominal viscera than following operations on other parts of the body. The condition may occur as a sequel to septic abortion. Post-operative parotitis is usually unilateral. Less than half of the cases develop suppuration.

Etiology.—While a close glandular and sympathetic relationship exists between the parotid gland and the pelvic organs, as is evidenced by the ovaritis that develops during the course of mumps, and the increased salivary secretion of early pregnancy and menstruation, it is unlikely that this plays any part in the etiology. In most cases of post-operative parotitis the infecting agent has its origin in some septic condition of the mouth or upper air-passages, as, for example, carious teeth, Vincent's angina, pyorrhœa, sordes, and other evidences of faulty oral hygiene, infected tonsils and adenoids, and chronic posterior rhinitis and pharyngitis. In the majority of cases some of these findings have been noted, and the infecting organism is believed to gain access to the gland by passing up Stenson's duct. The staphylococcus pyogenes aureus has been found more frequently than any other organism in the pus of post-operative parotid abscess.

The conditions favoring the development of parotitis are the dry condition of the mouth induced by the anæsthetic, as well as the nervous influences that affect the secretions, the lowered intake of water, the removal of fluid from the body due to vomiting, and the mechanical insult to the tissues by swabbing the mouth during anæsthetization. The fact, too, that of the three salivary glands the parotid is the only one supplied with lymphatics may have a part in favoring the development of this condition.

Symptoms.—The infection is recognized by a reddened and painful swelling in the parotid region, accompanied by fever, and rarely chills, developing a few days after operation. The swelling may subside under treatment or go on to the formation of an abscess, with characteristic symptoms.

Treatment.—Treatment begins with prophylaxis. Carious teeth should be extracted, infected tonsils removed, pyorrhœa and other manifestations of oral and nasal sepsis treated. These cavities should be brought to the highest degree of surgical cleanliness by the use of the tooth-brush, mouth-washes, and nasal irrigations of weak potassium permanganate (1:10,000) or other suitable antiseptic solutions.

The body should be well supplied with fluids both before and after operation, and during anæsthetization intraoral manipulation should be avoided as much as possible.

Should parotitis develop, it may be successfully combated by continued use of the mouth-washes in order to favor drainage from the gland, and the local application of compresses wet with cold solutions, such as saturated boric acid, 1 per cent. aluminum acetate, or 1:5000 mercury bichloride. An ice-collar may be applied to the gland. Stimulating ointments, such as 10 to 25 per cent. ichthyol or isarol, may be applied, or the gland may be painted with tincture of iodine.

If an abscess forms, it should be opened by a free incision, the pus evacuated, the cavity irrigated and packed with narrow strips of gauze impregnated with 2 per cent. dichloramine-T, with proper renewal of dressings.

ACIDOSIS

Etiology.—All alkaline bases that are left after the non-volatile acids have been neutralized are converted into bicarbonate, and since the bicarbonate content of the blood in the normal individual is constant, any decrease in the alkalinity may be regarded as an acidosis.

Acidosis is due either to the incomplete combustion of fat with the formation of ketone bodies, beta-oxybutyric acid, diacetic acid, and acetone, or to the failure of the kidneys to eliminate the acids normally eliminated by them. In acidosis due to the first cause the ketones appear in the blood and urine, and the breath takes on an aromatic odor.

Symptoms.—Frequently a mild acidosis may exist without evincing symptoms. If, however, the acidosis becomes more severe, the patient will exhibit a symptom-complex such as the following: A peculiar hyperpnoea without cyanosis (air hunger); vomiting; headache; acetone and diacetic acid in the urine if the acidosis follows anæsthesia, diabetes mellitus, or starvation, but not if the acidosis is due to renal disease; aromatic odor on the breath in the cases exhibiting ketones in the urine.

Diagnosis.—In order to make a diagnosis of acidosis a number of methods are available. In the first place, the condition may be suspected if the symptom-complex of acid intoxication just described, with its peculiar respiration, vomiting, and headache, is present. To base the diagnosis on this finding alone, will, however, lead to a considerable percentage of error, for in a certain number of cases further investigation by special methods has repeatedly failed to confirm it. When, however, in conjunction with the characteristic symptom-complex, acetone and diacetic acid are found in the urine, the diagnosis is much more justifiable. It must be remembered that acetone and diacetic acid appear in the urine in many mild cases of acidosis, and has no bearing on the prognosis. This is especially frequent in children. Thus, Holt has found acetonuria in 70 per cent. of the pneumonias of children. For the recognition of and to insure the more accurate diagnosis of all forms of acidosis, one of the newer methods now available, such as the Van Slyke method for determining the bicarbonate content of the blood, or the Marriot, Fredericia, or Plesh-Higgins method for determining the alveolar CO_2 tension of the expired air, should be employed. One of these methods ought to form part of the equipment of every hospital laboratory for routine use in the study of all patients in whom acidosis may be

suspected or, indeed, until we have acquired further knowledge of this subject. The Marriot method is very simple, and can be carried out in a few minutes in the physician's office as well as in the hospital ward. The Van Slyke method can be conducted in any well-developed hospital laboratory, and does not require any special coöperation on the part of the patient. The methods for determining the CO_2 tension of the alveolar air may give incorrect results if the patient has an irritable respiratory center or if a pathologic pulmonary condition is present, or one that will cause too rapid or embarrassed breathing.

For routine use the methods just mentioned are the best. Other methods that are available are the hydrogen ion determination of concentration in the urine and blood; also the quantitative determination of the ketone bodies in the urine and blood, and finally the method for ascertaining the ammonia content of the urine in cases in which there is a ketonuria. These last described methods are valuable if they can be carried out in conjunction with the first-mentioned methods, since they tend to make the study of the case more thorough.

Treatment.—The treatment is largely prophylactic. All operative cases should be examined for acetone and diacetic acid, and where these are found, the degree of acidosis should be determined and treatment should be directed accordingly. When there is apparent a predisposition to acidosis, immediately after operation sodium bicarbonate (2 per cent.) and glucose (5 per cent.) solution should be given per rectum by means of continued or interrupted enteroclysis.

In the treatment of post-operative acidosis, if there is no contraindication from a surgical standpoint, the gastro-intestinal tract should be cleared by the administration of castor-oil and enemas. Diuresis should be promoted in cases of renal or cardiorenal deficiency. Sodium bicarbonate should be given by mouth, by rectum in 2 to 5 per cent. solution, or intravenously, 1 to 2 per cent. (500 to 1000 c.c.). Glucose may be exhibited by the mouth or given in 5 to 10 per cent. solution by the rectum, or Kahlbaum's dextrose may be injected intravenously (2.5 per cent.) in normal salt solution. The dose should be regulated by observing the effect of the remedy on the reaction of the urine. The urinary fluid should be rendered neutral, but not distinctly alkaline.¹

BIBLIOGRAPHY

- ANDERS, J. M.: "Ether Pneumonia." University Med. Mag., Phila., 1897.
ANSPACH, B. M.: "Enterostomy and Enterocolostomy in the Treatment of Acute Intestinal Obstruction Following Pelvic Operations." Jour. Amer. Med. Assoc., 1918.
AUSTIN, J. H.: "Acidosis." Penn. Med. Jour., 1916-17, xx, 356.

¹ Farrar has recently reviewed the chemical constituents of the blood and their relation to lung ventilation in health. She notes the importance of the bicarbonates in the blood as constituting the alkali reserve in the body, and the standard CO_2 combining power of the blood plasma in women. There is a fall in the alkali reserve during operation, and this bears a certain relation to the blood pressure and respiration. There is a certain incidence of acute acidosis in operation, and it has considerable importance as a factor in shock.

Farrar reports a series of cases at the Woman's Hospital in New York, which were treated during operation with glucose (20 per cent.) and gum acacia (6 per cent.) given intravenously, and shows their value in maintaining blood pressure, nutrition, and diuresis.

- BAISCH, K.: "Die Prophylaxe der post-operativen Cystitis." Münch. med. Wochenschr., 1903, No. 38, 1628; *Ibid.*: "Erfolge in der prophylaktischen Bekämpfung des post-operativen Cystitis." Cent. f. Gynäk., 1904, Bd. lxxviii.
- BALDY, J. M.: "The Mortality in Operations Upon Fibroid Tumors of the Uterus." Amer. Jour. Obst., 1905, lii.
- BONNEY: "The After-treatment and Post-operative Complications of Coeliotomy for Pelvic Disease in Women." Lancet, London, 1899.
- BOVÉE, J. W.: "The Influence of the Trendelenburg Position in the Quantity of Urine Excreted During Anæsthesia." Trans. Amer. Gyn. Soc., 1910, 443.
- CLARK, J. G.: "Etiology of Post-operative Femoral Thrombophlebitis." Univ. of Penna. Med. Bulletin, July, 1902.
- COLLINS, G. H.: "Parotitis as a Post-operative Complication." Surg., Gynec. and Obstet., 1919, xxvii, 404.
- DYBALL: "Parotitis Following Injury or Disease of the Abdominal and Pelvic Viscera." Annals of Surgery, Phila., 1904.
- FAHRAR, DR. LILLIAN K. P.: "Acidosis in Operative Surgery and Its Treatment by Glucose and Gum Acacia Given Intravenously." Trans. of Amer. Gyn. Soc., 1920.
- FURNISS: "Post-operative Renal Infection." Trans. Sect. O. G. and A. S., A. M. A., 1913, 49.
- GATCH: "The Effect of Laparotomy Upon Circulation." Trans. Amer. Gyn. Soc., 1914, xxxix, 180.
- GEBELE: "Über embolische Lungen-Affektionen nach Bauch-operationen." Beitr. z. klin. Chir., Bd. xliii.
- GERULANOS: "Lungen Complicationen nach operativen Eingriffen." Deutsch. Zeitsch. f. Chir., Leipzig, 1900.
- HÖLSCHER: "Experimentelle Untersuchungen über die Entstehung der Erkrankungen der Luftwege nach Aethernarkose." Archiv f. klin. Chir., Bd. lvii.
- HURD: "Post-operative Insanities and Undetected Tendencies to Mental Disease." Amer. Jour. Obst., N. Y., 1899.
- KELLY, H. A.: "Post-operative Psychoses." Trans. Amer. Gyn. Soc., 1909, 426.
- KELLY, JAS. A.: "Acid Intoxication: Its Significance in Surgical Conditions." Annals of Surgery, Phila., 1905, xli, 161-200.
- MANTON, W. P.: "Parotitis Following Induced Abortion in a Case of Pernicious Vomiting of Pregnancy." Trans. Sect. O. G. and A. S., A. M. A., 1918, 146.
- MIKULICZ, VON: "Pneumonie." Centralbl. f. Chir., 1901, No. 29.
- MILLER, G. B.: "Complications Following Operations." Kelly-Noble, Gynecology, chap. xxvi, ii, Phila., Saunders, 1907; *Ibid.*: "Post-operative Thrombosis and Embolism." Amer. Jour. Obst., 1907, lvi, No. 3, 347.
- MOYNIHAN, B. G. A.: Abdominal Operations, 2905, W. B. Saunders & Co., Phila. and London.
- NEUGEBAUER, VON: "87 neue Beobachtungen von zufälliger Zurücklassung eines Sub-operatione benutzten Fremdkörpers in der Bauchhöhle, etc." Zent. f. Gynäk., Leipzig, 1904.
- OLSHAUSEN: "Über eine bisher unerkannte Todesursache nach Laparotomien mit Eventration der Darmschlingen." Zeitsch. f. G. u. G., Leipzig, 1888, xii, 238-241.
- POLAK, J. O.: "Acute Gastric Dilatation as a Post-operative Complication." Trans. Amer. Gyn. Soc., 1909, xxxiv, 466; *Ibid.*: "A Clinical Study of Blood-Pressure, Pulse-Pressure and Hemoglobin Estimations, in Post-operative Shock, Hemorrhage and Cardiac Dilatation." Trans. Amer. Gyn. Soc., 1917, xlii, 583; *Ibid.*: "The Conduct of Gynecological and Obstetrical Operations in the Presence of Acute and Chronic Endocarditis." Trans. Amer. Gyn. Soc., 1913, No. 38.
- SCHENCK: "Thrombosis and Embolism Following Operation and Childbirth." Trans. Amer. Gyn. Soc., 1913, xxxviii, 295.
- SIMPSON, F. F.: "Post-operative Complications Involving the Alimentary Tract." Amer. Jour. Obst., 1907, lvi, No. 3, 332; *Ibid.*: "Right-sided Hypertension with Occasional Cardiac Dilatation as Post-operative Complications." Trans. Sec. Obst., Gyn., and Abdom. Surgery, A. M. A., 1913.
- TAUSSIG, F. L.: "Bladder Function After Confinement and After Gynecological Operations." S., G. and O., 1915, xxi, 416; also in Trans. Amer. Gyn. Soc., 1915, No. 40, 351.
- THOMSON and KEMP: "Experimental Researches on the Effects of Different Anæsthetics," Med. Rec., N. Y., 1898.

- TRACY, S. E.: "A Simple and Efficient Means of Applying Artificial Heat." Jour. Amer. Med. Assoc., October 22, 1910, 144.
- VEIT, J.: "Die Prophylaxe der Embolie nach gynäkologischen Operationen." Zentralblatt f. Gynäkologie, 1910, xxxiv, No. 1, 1.
- WARD, G. G.: "Post-operative Renal Infection." Trans. Amer. Gyn. Soc., 1915, xl, 337.
- WEIBEL, M.: "Weitere Beobachtungen über das Verhalten der Ureteren nach der erweiterten abdominalen Karzinomoperation." Zeits. f. Gyn. u. Urol., 1913, iv, 138.
- WELSH: Albutt's System of Medicine, 1898.

CHAPTER XXXIX

MECHANICAL AND MEDICINAL AIDS TO TREATMENT

ABDOMINAL SUPPORT: BINDERS AND BANDAGES

ABDOMINAL binders are used for the purpose of lending support to the abdominal walls in cases of pendulous abdomen, diastases of the rectus muscles, umbilical hernia, floating kidney, gastroptosis or visceroptosis, sacroiliac sprain, and recent celiotomy incisions.

After abdominal section an abdominal bandage does little actually to prevent the formation of a hernia, but it tends to remind the patient of her late experience and affords a certain amount of protection to the scar, which at this time is not so firm and strong as it subsequently becomes. Such bandages should be very simple ones, and may be discarded after two or three months, unless the patient is extremely stout or has a pendulous abdomen, when the support afforded by a corset or a binder should be continued.

In cases of pendulous abdomen, general visceroptosis, floating kidney, or separation of the recti, a properly fitting corset¹ will, in the majority of instances, be more comfortable and more effectual than a binder. The corset should be designed especially for this purpose, and should be made in one piece. When properly fitted and applied, the support given to the abdomen by such a corset comes not directly from in front, but from below and in front, and in that way the entire lower abdomen is supported (see Figs. 450, 451, and 501).

The patient should lie in the recumbent position while putting on her corset. The corset should fit the lower abdomen snugly, and it should exert no constriction or pressure about the waist-line and the epigastrium.

¹ Corsets may be designated as neutral, bad and good. The majority of corsets are neutral, that is, they are of such construction, and worn so loosely that they affect the carriage in no important manner. The features of the bad corset are: 1. They are long behind (especially at the top) and short in front (especially at the bottom). 2. They are cut to exert their greatest pressure at the waist. 3. They have strongly marked sacral curves, and are highly incurved at the waist in front.

The features of the good corset are: 1. They lace in front. 2. They reach to the level of the trochanters. 3. They are not high enough in front to touch the breasts. 4. They fit tightly around the pelvis (especially in the space between the iliac crests and the trochanters, and decrease regularly in the pressure which they exert from the lower to the upper edge. 5. They are slightly incurved at the waist line at the back and sides, but show no waist curve in front.

Briefly, so far as posture is concerned, the bad corset throws the center of gravity forward; the good corset holds it in its proper position. In addition to its effect on equilibrium, the bad corset constricts the waist, depresses the lower abdomen, and affords no support to the pelvis or the sacroiliac articulation. The good corset, in addition to maintaining correct equilibrium, supports the pelvis, sacroiliac joint, and lower abdomen, and exerts no constriction at the waist. The correction of the equilibrium may be graphically determined by the change in the posterior and anterior outlines of the body. (Reynolds and Lovett. Dickinson.)

There are a number of binders on the market which in some cases—for example, very obese women and those who are not accustomed to wearing corsets—will be more satisfactory than a corset. Such a binder supports the abdomen from below, is attached to the garters that hold it in place, does not contain any whalebone, rubber, or leather, and may be washed without injury.

In some cases of nephroptosis a pad may be attached to the corset in such a position that when adjusted it lends additional support to the kidney. In the average case the kidney pad is not required. In cases of ventral or umbilical hernia a specially devised pad of hard rubber may be attached to the binder or corset. In cases of sacroiliac sprain, static backache, etc., a steel brace or an inner reinforcing belt may be attached to the corset.

LOCAL APPLICATIONS

To the Endometrium.—Not many years ago the accepted method of treatment for patients who had a discharge from the uterus consisted in making intrauterine application of disinfecting solutions. At the present day, with the perfection of operating technic, increasing accuracy in diagnosis, etc., it has become recognized that applications to the endometrium are rarely indicated, except in connection with instrumental dilatation and curettement of the uterine cavity.

During the acute stage of an infection all local treatment is harmful, and in the chronic stage there are almost invariably present lesions of the adnexa that forbid intrauterine applications except in connection with other operative treatment.

It is quite difficult, moreover, to make an application to the endometrium with any degree of thoroughness or uniformity unless the patient is anaesthetized and the cervical canal is thoroughly dilated. The truth of this statement can easily be appreciated if one remembers the shape of the uterine cavity and the difficulty experienced in passing a sound through the undilated cervix in an unanaesthetized subject. Even if it were possible to pass a sound wrapped with cotton, the solution in the cotton will be expressed long before the sound reaches the endometrium.

Various forms of intrauterine syringes for the purpose of injecting solutions have been devised, but all must be used with caution. When the endometrial cavity is filled under pressure, some of the fluid may escape into the tubes or even into the peritoneal cavity. To prevent such a disaster, the cervical canal must not be obstructed at the moment of injection, and only a small and limited amount of solution must be used at a time. A form of syringe that renders injection safe is one fitted with a long nozzle, the end of which is roughened and contains lateral perforations. This nozzle is wrapped with sterile cotton and introduced into the endometrial cavity; the solution is then injected into the cotton and brought into contact with

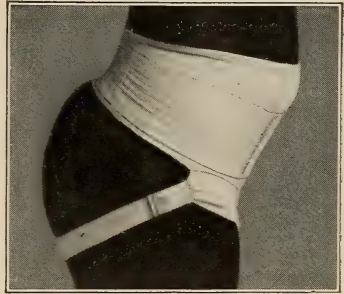


FIG. 501.—Abdominal binder for post-operative use. (Storm.)

all parts of the endometrium. Even this is quite unsatisfactory without the aid of general anæsthesia and full dilatation of the cervix; when these conditions exist, it is advisable to curette the uterus and wash out the blood and endometrial débris with a two-way catheter before making the application. The solution that is best adapted for intrauterine application is tincture of iodine. Others that have been recommended are alcohol, 95 per cent.; argyrol, 25 per cent.; silver nitrate, 10 per cent. (followed by salt solution); formalin, 1 per cent., etc.

To the Cervix.—Applications to the cervix are frequently made for the purpose of treating a cervical leucorrhœa. Such a discharge may be due to primary infection by the gonococcus, or it may simply be a hypersecretion of the cervical glands when the cervical lips have been everted by laceration and the cervical mucosa has been exposed to various forms of trauma. In either event applications are not entirely satisfactory. It is difficult to apply a disinfecting solution to the entire cervical canal without overstepping its boundaries and encroaching upon the endometrium. Moreover, the cervical mucosa is so rich in folds and is covered by so thick and tenacious a mucus that it is exceedingly difficult to reach the bottom of these folds and get at the nidus of infection.

It is evident that no application will cure a cervical discharge that is due to an eversion of the cervical mucosa and mechanical irritation. The most that can be done under such conditions is to hold the symptoms in abeyance.

Before the application of a disinfectant an effort should be made to remove the thick mucus; this is often almost impossible to accomplish with any satisfaction. Various solutions have been employed for the purpose, such as alcohol, silver nitrate, and dilute alkaline solutions of various kinds. After the mucus has been removed the disinfecting solution may be applied by means of a cotton applicator, care being taken to reach all parts of the cervical canal but not to go beyond the internal os. The difficulty of determining just when the instrument has reached the internal os may be appreciated at once.

The most effectual method of destroying a cervical infection is by means of the actual cautery (see page 704).

Cervical infections may also be influenced by the introduction and application of glycerine tampons to the external os and the use of prolonged hot douching; dilatation of the external os may be of service where the orifice is narrow and the pus is retained within the canal.

To the Vagina.—Applications to the vagina may be made directly through a bivalve speculum (see Fig. 502) with a cotton-wound applicator, the mucosa being cleansed with cotton before the solution is applied. In certain cases the therapeutic solution may be simply poured into a tubular or a bivalve speculum while the patient lies in the dorsal position with the hips elevated; the excess of solution is removed with cotton. Applications of disinfecting solutions to the vaginal mucosa should be supplemented with vaginal tampons.

To Bartholin's Glands.—Applications to Bartholin's glands or ducts can be made with a fair degree of satisfaction by means of a hypodermic needle

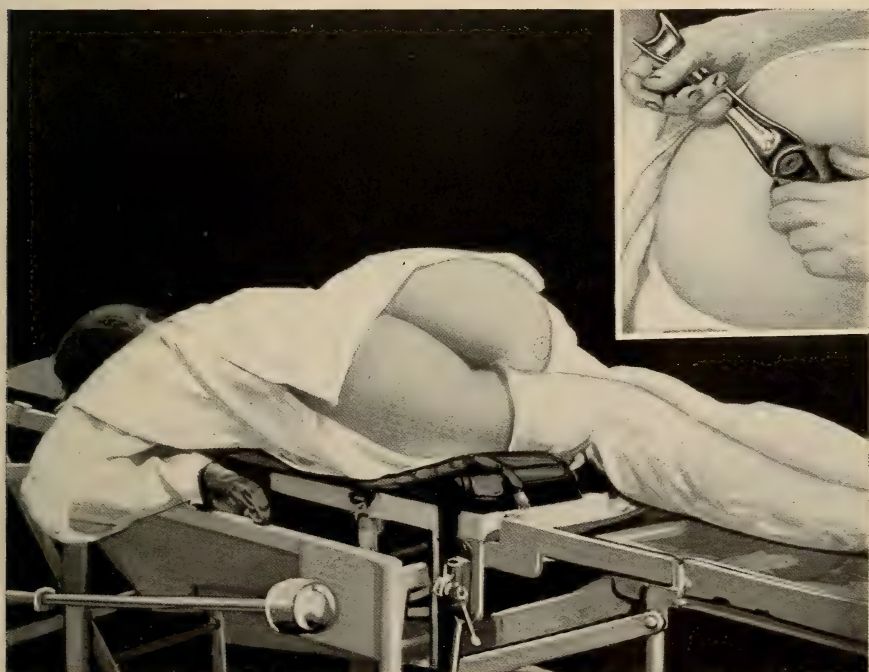
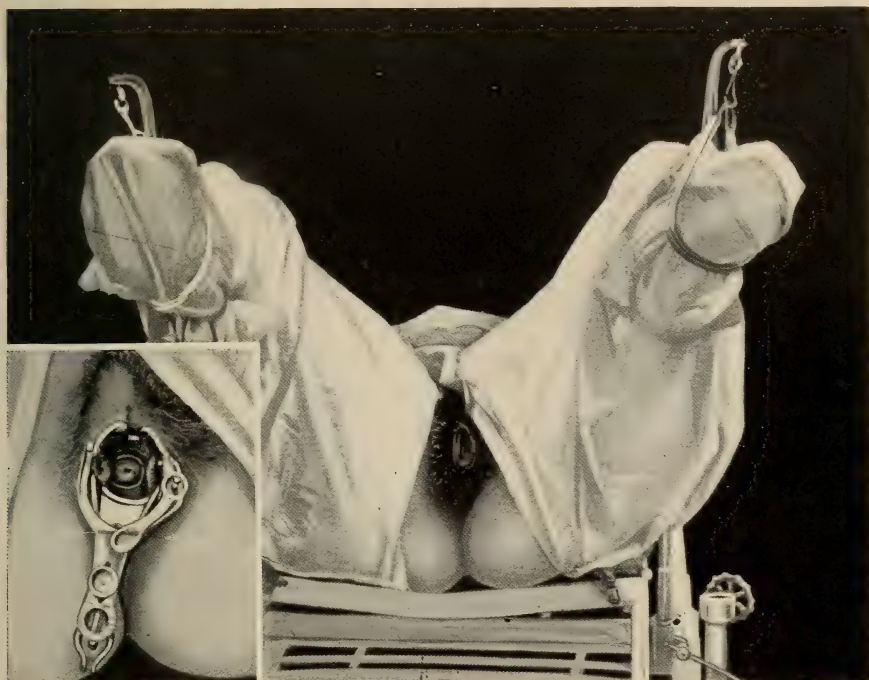


FIG. 502.—Bivalve and Sims' specula introduced. (Anspach, in Hare & Landis' Modern Treatment, Lea & Febiger.) Patient in the dorsal and in the Sims' position; exposure of cervix and vaginal vault for inspection and treatment.

with a blunt point. The needle is guided into the duct as far as it will go, and a few drops of the fluid are expressed under pressure.

To the Urethra and Skene's Tubules.—Application to the urethra may be made by means of a small cylinder of cotton wrapped upon an applicator, which is passed into the urethra and then detached from the applicator and allowed to remain. Applications to Skene's tubules may be made with a blunt hypodermic needle. The technic of these applications has been described on pages 441 and 444.

THE USE OF HEAT IN THE TREATMENT OF PELVIC INFLAMMATORY DISEASES

For the local application of heat in pelvic inflammatory cases Gelhorn devised a hot-air apparatus that may easily be constructed and is not expensive. The heat can be very effectually applied without discomfort, and the degree of heat can easily be regulated.¹

The mode of application is exceedingly simple. The apparatus, with the thermometer carefully adjusted, is placed over the exposed abdomen, and the electric light is turned on. It is preferable that the heat be increased gradually, and for this purpose the apparatus is not covered with blankets until after a few moments' exposure. The degree of heat obtained can be noted at any time, and may be reduced or increased at will. While the temperature can be easily raised to 300°, from 200° to 220° seems the most suitable temperature; with eight 16-candle-power bulbs this degree is reached within from fifteen to twenty minutes. As the reaction to the treatment may vary in the individual case, patients should not be left alone, and the pulse should be watched carefully. A cold cloth is placed on the forehead of the patient, and she is urged to drink cool water freely.

The patients, at first, feel quite comfortable. In about ten minutes, however, when the temperature reaches 180°, they frequently complain of intense burning. It is imperative, then, to discontinue the treatment for the time being. The sensitiveness decreases with each application, so that after a few days the baking process may be continued for one-half hour or even longer, the temperature being raised to 220°. The patients perspire

¹ Gelhorn's apparatus consists of two semi-circular cradles made of thin sheet-iron and covered on the inside with asbestos. These two cradles fit over each other and may be pulled apart, after the fashion of a telescope. Electric-light bulbs, eight in number, are attached to the inside of the free edges, and there is a long, suitable attachment for the nearest socket. In the convexity of the cradle a hole is provided for a thermometer. The mercury bulb of the latter should be only about two or three inches above the abdomen, so as to register the actual temperature of the immediate surroundings and not the temperature of the air in the upper portion of the chamber, which naturally is warmer than in the lower portion. If no thermometer is used, this hole may serve as a chimney through which the hot, moist air can escape. A number of hooks are present, from which gauze bags filled with calcium chloride may be suspended, in order to absorb any excess of moisture within the air chamber.

This apparatus has many advantages. It is light, portable, and clean. There is no danger from fire, although care must be taken to prevent the calcium bags from touching the electric bulbs, lest they explode. The heat can easily be regulated by eliminating one or more bulbs, thus avoiding burns of the skin. By changing the candle-power of the bulbs any desired degree of heat may be obtained. By pulling the cradles apart a larger portion of the body, or even the entire body, according to the indication, can be heated. Convenient electro-thermic heating apparatus—adapted to the pelvis—is now on the market.

freely over the entire body, especially on the abdomen. The exposed skin becomes an intense red, either diffuse or in more circumscribed areas.

The immediate effects of the treatment consist in a marked decrease of pain and improved appetite, and large quantities of water can be taken. Many women gain in weight, and constipation is relieved. Some experience a pleasant sensation of relaxation and fall into a refreshing sleep. Burns of a mild degree may occur, but with proper precautions can be avoided. Gelhorn has observed small blisters in two cases only, and in these there was profuse perspiration and the skin had not been wiped off promptly.

There is no absolute rule as regards the duration of the treatment or the degree of heat that should be used. It is best to go slowly, and the temperature should never be increased when the patient complains of heat. After the treatment the patient should be permitted to cool gradually, remaining in the apparatus for one-half hour or being wrapped in warm blankets. A cool sponge-bath may be given directly after the treatment.

The principal indications for this treatment are found in chronic inflammatory lesions of the pelvis. It should not be used while the patient shows any elevation of temperature, and if an elevation of temperature follows its use, the treatment should be suspended. The number of treatments required in individual cases varies from eight to thirty-five.



FIG. 503.—Smith pessary; the form most frequently used in the treatment of retroversion.

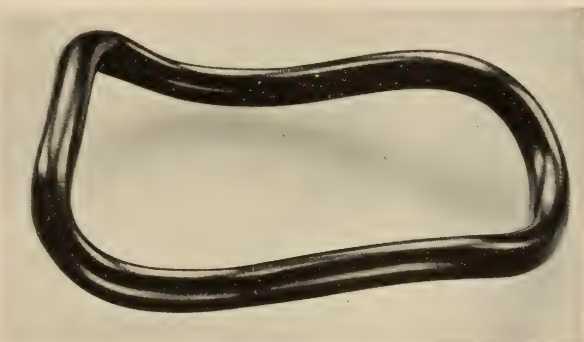


FIG. 504.—Hodge pessary; has a slightly concave upper bar with less marked upper curve and a broader lower bar than the Smith pessary, useful when the posterior vaginal vault is shallow and the perineum is relaxed.

ELECTRICITY

The use of electrotherapy in gynecology is more or less in disrepute, and in recent years it has probably fallen into disuse among reliable practitioners. Under certain conditions and in some affections its use may be justified. The negative pole of the galvanic current is occasion-

ally an effectual treatment for amenorrhœa. An ill-developed uterus is said by some authorities to have been increased in size as the result of the use of intrauterine galvanism or faradism.

In employing intrauterine electric treatment great care must be taken to sterilize the vaginal canal and the electrode. The electrodes must be boiled. The cervix should be exposed through a bivalve speculum, the os cleansed with cotton, moistened with a weak bichloride solution, and the sterile electrodes should be passed directly into the uterine cavity without touching anything but the cervix. A large, flat, moist electrode should be placed externally upon the abdomen.

PESSARIES

The pessary that is most useful in the treatment of retroversion is that devised by **Smith** (see page 250). The Smith pessary may be used also in descensus and in slight degrees of prolapse in younger women during the reproductive period. When the pessary is not satisfactory in such cases, operation should be advised (see page 613).

Most cases of prolapse are seen in women past the menopause, and here the **ring pessary** is the one of choice. A ring pessary is held in place by the lateral attachments of the vagina, and is supported to a certain extent by the rami of the pubes. A

FIG. 505.—Soft-rubber ring pessary; useful in descensus in elderly women with narrow vaginal orifice.

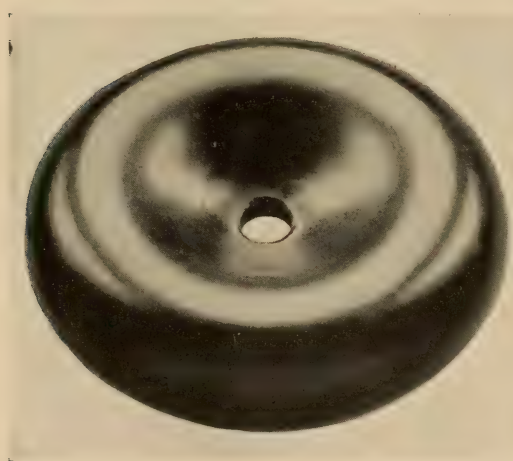


FIG. 506.—Disk pessary; useful in elderly women with descensus and marked cystocele.

hard- or a soft-rubber ring pessary, a hard-rubber **disk pessary**, or a **Menge pessary**, according to the varying conditions of the case, will be indicated.

In mild cases, when the vaginal introitus is not contracted and the vaginal walls are not excessively redundant, a hard-rubber ring pessary may be used. When the vaginal introitus is of such size that a pessary large enough to distend the vaginal fornices could not be passed through it with-

out causing great pain, a **soft-rubber** one should be substituted. This may be compressed during its introduction through the vaginal orifice.

When the anterior vaginal wall especially is redundant and has a tendency to prolapse through the central opening of a ring pessary, a disk pessary (Fig. 506), which affords a larger base of support, may be used.

Menge has modified the ring pessary by attaching to it a sort of rudder that holds the pessary with its plane transverse to the long axis of the vagina (see Figs. 286, 507, and 508). Altogether this is the most satisfactory form of pessary for use in prolapse cases.

Certain principles must be observed in the use of a pessary in order to insure its success. A pessary must never be employed for the purpose of exerting pressure; if this is necessary in order to hold the uterus in a



FIG. 507.—Menge pessary (assembled); useful in prolapsus in elderly women.

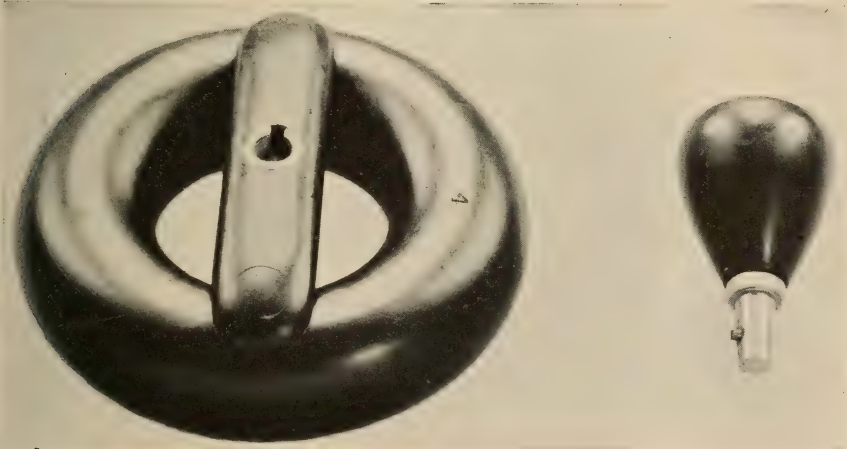


FIG. 508.—Menge pessary (with stem detached).

proper position, then pessary treatment is not indicated. Adnexal diseases contraindicate the use of a pessary.

The pessary should always be carefully selected and fitted for the indi-

vidual case. *It should be removed every four to six weeks for cleansing, in order to prevent any irritation or soreness of the vaginal walls with which it comes in contact. It should be left out for a few days and then replaced.*



FIG. 509.—Intrauterine douche nozzle. Bozeman-Fritsch model.

If douches are required, they should be made of sterile water with a liquid antiseptic only. Douche powders should not be used, thus avoiding the deposition of salty incrustations on the pessary.

THE ELECTROCAUTERY AND THE THERMOCAUTERY

Hunner has used the cautery especially in the treatment of cervical infections, his method being to make radical strokes into the mucosa to a depth of nearly

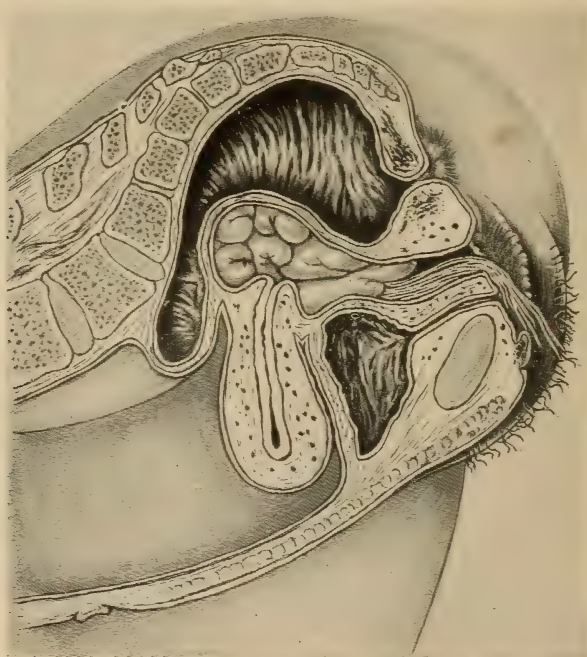


FIG. 510.—Vaginal vault packed with tampons. (Anspach, in Hare & Landis' Modern Treatment, Lea & Febiger.)

1 cm. He uses this method in office practice, and claims to have had considerable success with it. The only objection to the method is the fact that it is followed by sloughing, with its consequent danger and annoyance to the patient. In

most cases in which its use would be indicated a surgical operation would be preferable, but if the patient has a decided objection to surgical measures, the cautery may be employed (see Hunner's original paper for technic).

THE UTERINE PACK

The use of an intrauterine tampon is very rarely required except in connection with some form of operative treatment, as, for example,

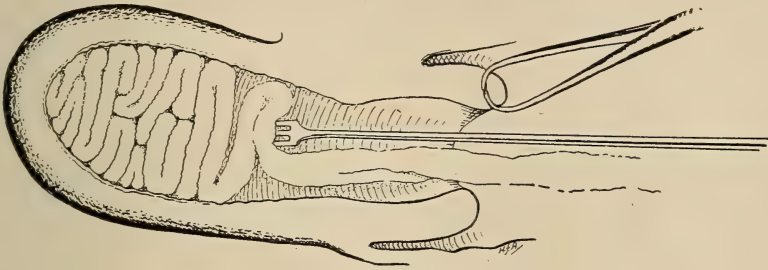


FIG. 511.—Uterine pack.

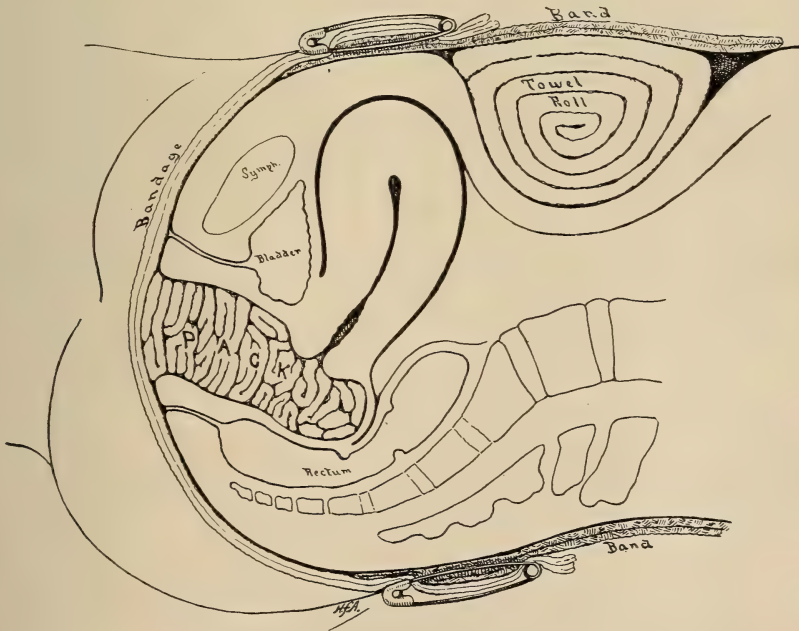


FIG. 512.—Vaginal pack with suprapubic pressure.

after the removal of retained secundines from the uterine cavity, or in emergency cases, when profuse bleeding is associated with cancer, sarcoma, or fibroid tumor. Before introducing the tampon the operator should know the exact size and length of the uterine cavity, and

the vagina and cervix should be carefully disinfected. A narrow pack is used, and the greater bulk of it is passed into the body of the uterus, a single strip usually being placed in the cervix, so that drainage from the body of the uterus will be perfectly free. Such a uterine tampon or pack may, be-

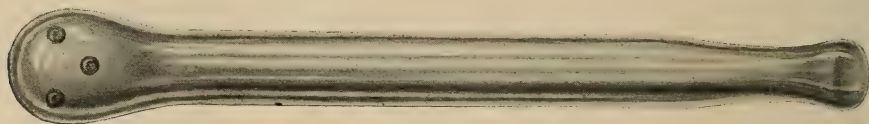


FIG. 513.—Vaginal douche nozzle of glass.

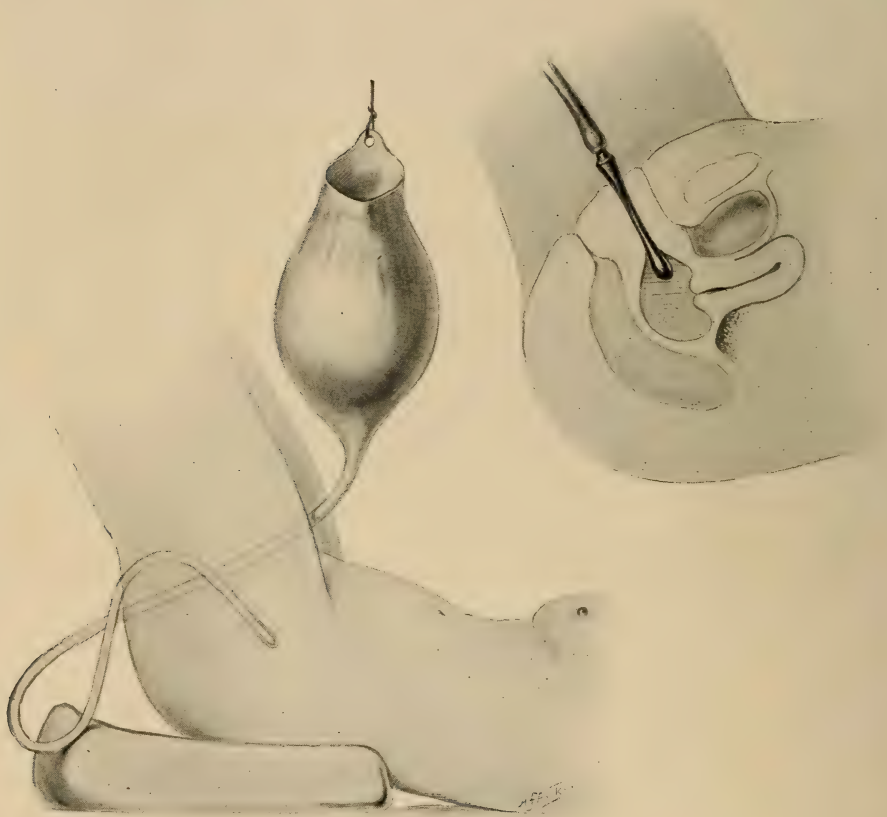


FIG. 514.—Sketch of correct position for douche.

fore its introduction, be moistened with an antiseptic, such as the tincture of iodine, or with an astringent, such as a solution of suprarenal extract (Figs. 510 and 511).

THE VAGINAL DOUCHE

A vaginal douche may be used for three purposes: (1) Simply to cleanse the vagina; (2) for the purpose of applying heat to the pelvis, so

as to favor the absorption of intrapelvic inflammations and exudates; (3) in order to bring an antiseptic, disinfecting, or astringent solution into contact with infected or inflamed cervical and vaginal surfaces.

To be effectual, a vaginal douche should be taken with the patient in the recumbent posture (Fig. 517); if it is taken while in a sitting or semi-sitting position the douche water escapes almost as soon as it enters the vagina, and the solution may not reach all parts of the vaginal vault. The benefit derived from a douche used to promote absorption of pelvic exudates depends upon the degree of heat that is carried in this way to the bases of the broad ligaments and the pouch of Douglas, and the length of time it is maintained. In order to distend the vaginal vault as much as possible in such cases, the patient should lie in bed with the hips elevated upon a douche pan, but with no pillow under the shoulders. The douche

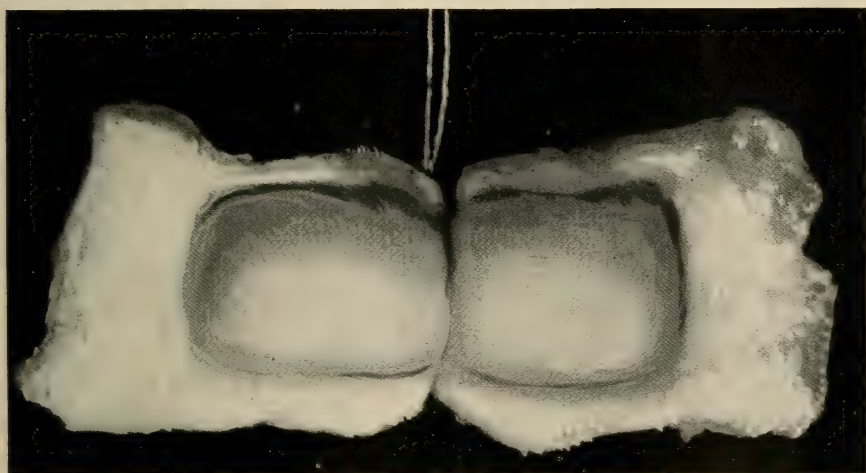


FIG. 515.—Vaginal tampon.

bag or reservoir should be suspended only a short distance above the level of the bed, so that the water will run very slowly.

The water should be as hot as the patient can endure without discomfort (110° F.). A large quantity—a gallon and even two or three gallons of solution—is desirable, and at least from fifteen to twenty minutes should be consumed in giving the douche. The douche nozzle may be of glass or of hard rubber, with lateral perforations; it should be carefully cleansed after using, and kept in a weak antiseptic solution (bichloride 1:4000).

When the douche is used simply for its cleansing and thermic effect, it may be rendered bland by adding a tablespoonful of common table salt or borax to a gallon of water. When douches are used to allay inflammation or destroy infectious organisms in the vagina and upon the vaginal surface of the cervix, antiseptic and disinfecting agents are added to the water in various proportions, for example: Formalin, 1:1000; mercury bichloride, 1:4000; lysol, 1:200 or 400, etc.; for deodorizing purposes, potassium permanganate, 1:5000; for astringent purposes, powdered burnt alum or zinc

sulphate, of each, 1 to 4 drams to a quart of water; or a douche powder that combines antiseptic and astringent properties may be prescribed, as, the A B C douche: Alum, $\frac{1}{2}$ ounce; boric acid, 3 ounces; phenol, $\frac{1}{2}$ ounce;

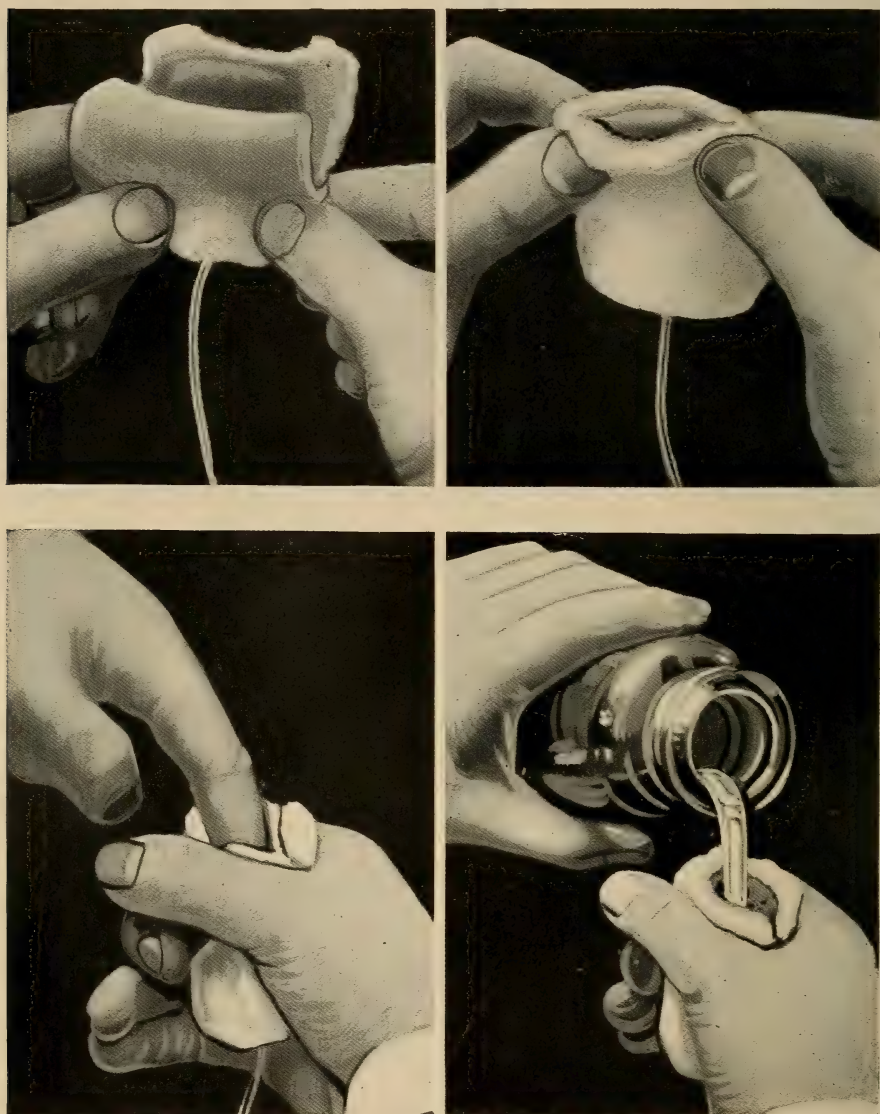


FIG. 516.—Filling vaginal tampon. (Anspach, in Hare & Landis' Modern Treatment. Lea & Febiger.)

oil of gaultheria, 30 minims. Mix and use teaspoonful to quart of water as directed.

THE VAGINAL TAMPON

Vaginal tampons (Fig. 515) are used for the purpose: (1) Of applying hygroscopic, emollient, disinfecting, or astringent solutions to

the vaginal walls or the vaginal portion of the cervix; (2) of exerting pressure upon the vaginal walls and giving a certain measure of temporary support to the uterus. They are made of absorbent cotton and lamb's wool—the latter being added for the reason that it does not "mat" when wet, helps to preserve the shape of the tampon, and is somewhat more resilient than cotton, and therefore capable of exerting more pressure.

Tampons are made by placing over a strip of absorbent cotton a smaller strip of lamb's wool, and binding them together in the center. They may be made of any size. For hygroscopic purposes, as, *e.g.*, to secure depletion of the uterus in cases of subinvolution, chronic pelvic inflamma-



FIG. 517.—Good type of corset.

tion, etc., glycerine is most commonly used; epsom salts in finely powdered form is also effectual. For emollient purposes, as after the application of silver nitrate or the tincture of iodine to the vaginal surface, cold cream or zinc ointment is the most effectual; when an antiseptic effect also is desired, phenol, 10 grains to 1 ounce, may be added to the zinc oxide, or a 10 per cent. ointment of ichthyol in petrolatum may be used. For antiseptic and disinfecting purposes aqueous solutions of argyrol and protargol (10 to 25 per cent.); silver nitrate, 1 per cent.; ichthyol, 10 to 20 per cent.; dichloramine-T (2 per cent. in eucalyptol), etc., may be used. For astringent purposes dusting powders, such as equal parts of powdered burnt alum, boric acid, and bismuth subnitrate, or equal parts of tannic acid and lycopodium are most satisfactory.

FIG. 518.

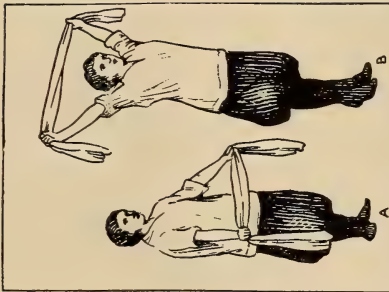


FIG. 519.

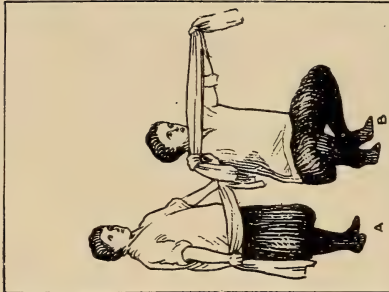


FIG. 520.

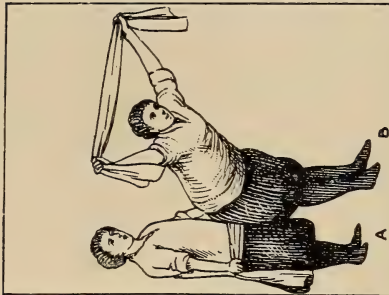


FIG. 521.

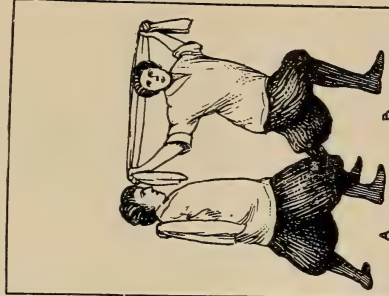


FIG. 522.

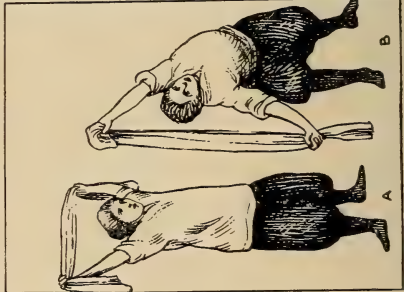


FIG. 523.

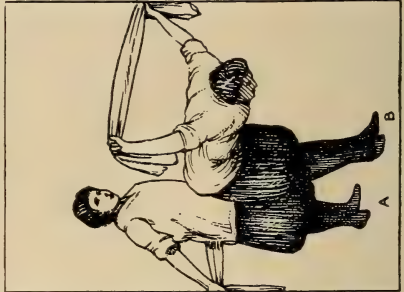


FIG. 524.

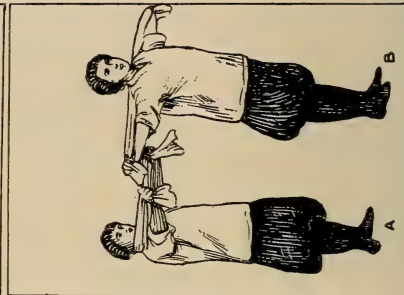


FIG. 525.

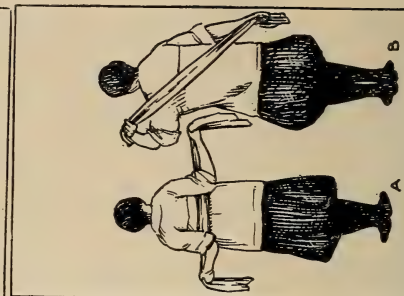


FIG. 518.—"First Exercise.—Secure a Turkish towel of sufficient length to enable you to take a wide reach. The towels used in the illustrations are made of two ordinary Turkish towels sewed together. Take a wide grasp, as in position (A). Pull strongly upon the towel, up on toes raising the arms above the head, as in (B). Lower to (A). This exercise develops the calves of the legs, the arms, the back, and expands the chest.

FIG. 519.—"Second Exercise.—From position (A) pull upon towel and bend knees, as in (B). This movement reduces fat on the hips and is a good balance exercise. Do not lean forward or backward, but keep erect as in figures.

FIG. 520.—"Third Exercise.—From a pull on towel (lower trunk forward, as in (B)), bend forward to a stoop-stand position. This corrects round shoulders and flat chest, and stretches all the muscles of the upper body. The hips, shoulders, head, and arms should be in a straight line. Practice in front of a mirror.

FIG. 521.—"Fourth Exercise.—This exercise is performed in four counts or parts. From ordinary standing position, as in first exercise position (A) count 1; charge, as in (A), right leg forward. On count 2 pull on towel, twisting body to the right, as in (B). On count 3 return to position (A), and on count 4 return to starting position. The same, left leg forward, twist to left. This exercise gives strong waist muscles and reduces fat in this region. Both heels should be kept solidly on the floor and the rear leg straight.

FIG. 522.—"Fifth Exercise.—On count 1, from starting position, raise arms above the head, charging to the right side, as in (A). On count 2, keep the weight of the body upon the right leg, bending to the right, as in (B). On count 3 return to position (A). On count 4 return to starting position. Perform the same to the left side, bending to the left. Bend only the charging leg. This exercise is sometimes called the 'liver squeezer,' and it stretches every muscle in the body.

FIG. 523.—"Sixth Exercise.—Grasp the towel in the rear, as in (A). Pull on the towel, bend forward, bringing arms up, as in (B). When (A) is again reached, bend backward. This is a good exercise for the abdomen and back.

FIG. 524.—"Seventh Exercise.—Finish the exercising with a deep-breathing movement. Towel back of neck, arms together in front, as in (A). Arms back as in (B), taking a deep breath while so doing, breathing out from (B) to (A) position.

FIG. 525.—"Eighth Exercise.—Take a sponge or towel bath by saturating either article in a basin of cool water. Wring the water out and quickly wash all parts of the body. Follow this with a dry rub. Saw and dry, coarse towel across the back, as in (A). Exercise 8; then up and across the back, first one side, then the other, as in (B). Rub all parts of the body until it is in a glow. You are then ready for anything the day may demand of you."

("Eight-minutes' common-sense exercise for the nervous woman." William J. Cromie, *The Outlook*.)

Tampons are either filled with the solution (Fig. 519), ointment, or powder, as the case may be, and then introduced with a dressing forceps through a bivalve speculum, or the therapeutic agent is first introduced and the tampons inserted afterward. The patient should be told how many have been used, and she should be directed to remove them at the end of twenty-four hours.

Tampons are used for the purpose of exciting pressure and giving support in the gradual replacement of a retroverted uterus, previous to the fitting of a pessary. In such cases the tampons should be of small size, and the string to each one should be long enough to reach from the vaginal vault to a point well outside of the introitus. The tampons should be soaked in glycerine and packed into the vaginal vault with the patient in the knee-chest position (see page 704).

CHAPTER XL

RADIUM AND RÖNTGEN RAY THERAPY

Radium.—Radium is a metallic element. It is used in the form of one of the salts (sulphate or bromide); the amount is always expressed in terms signifying the amount of radium element in the salt. During some of its radio-active changes radium takes the form of a gas which is called the emanation. This emanation can be used for therapeutic purposes.

Radium produces three varieties of radiations, designated as *alpha*, *beta*, and *gamma* radiations. The *alpha* rays have little penetrating power and no therapeutic value and may be confined by glass; the *beta* rays are more penetrating and have therapeutic properties, but all except the most penetrating are arrested by 2 mm. of lead; the *gamma* rays have the greatest penetrating power and are also used therapeutically. Although exposure to these rays has an injurious influence on all living cells, the normal tissues are more resistant than many of the tumor cells. On many tumor cells radium and the Röntgen ray have a selective action and the therapeutic use depends on this fact.

¹ In a general way, in the case of normal tissues, the more highly specialized cells, especially glandular secreting cells as those of the skin, testicle, ovary, thyroid, and certain lymphoid structures as the thymus, are more susceptible to radium rays and the Röntgen rays.

Cartilage, bone, fibrous connective tissue, and nervous tissue are very resistant. The effect of the rays on different tumor cells is very variable. Radium rays may disseminate a lymphosarcoma within forty-eight hours; no visible change whatever may be noticed for five or six days after exposure of a carcinoma of the cervix to the same rays and yet the growth may disappear entirely in from five to six weeks.

¹ "From actual clinical experiences, taking account of the various physical factors involved; we feel that the ovary is at least ten times as easily injured as normal skin; that the vaginal wall is four or five times as tolerant; that the mucous membrane and bladder wall are twice as tolerant; that the lining of the uterus is about equally as tolerant as the skin; that the rectal mucous membrane is equally tolerant; that the cervix uteri is at least twenty times as tolerant. The figures are confessedly only rough estimates, but afford a good working basis for actual treatment.

"The difference in toleration between the normal tissues and the epithelial new-growths in gynecologic cases is much more pronounced than in the dermatologic, which we have taken as our standard. The adenocarcinomata of the cervix uteri and of the body of the uterus are, on the average, more easily injured by radiation than are the epitheliomata of the same organs. It is our impression that most of the vaginal and cervical cancers are, as to tolerance, to be classified as more sensitive than the basal-celled epitheliomata of the skin.

"Some rectal cancers of the adeno-type are four or five times as susceptible as the skin epithelioma, and all of them except the pearl-forming, squamous-cell cancer met with at the anal margin are decidedly more easily injured by radiation than the skin epitheliomata. The ordinary papilloma and the malignant papilloma of the bladder require about the same dosage as skin epithelioma of the basal-cell type. Uterine fibroid tissue is very much more susceptible to radiation than the normal skin—perhaps four or five times as easily influenced." (Burnham.)

Filters of various substances are used to lessen the local effect of the rays, *e.g.*, lead, gold, platinum, silver, rubber, etc. The local reaction is also diminished by distance and increased by immediate contact. For example, packing the vaginal walls away from the cervix which is being exposed protects the vagina even better than a metal filter in contact with the vaginal wall.

With an exposure sufficient to cause local necrosis at the point of contact, it has been proven that the destructive effect upon malignant cells is not exerted beyond a distance of 2 to 4 cm. The *gamma* rays of radium are practically identical with the Röntgen rays. The therapeutic action of each is practically the same, but in many gynecological cases radium can be used with advantage in place of the Röntgen ray, since it can be applied more directly.

Histologically, the general changes noted in a malignant growth after radiations are disintegration of the tumor cells and formation of new connective tissue poor in blood-vessels.

CARCINOMA OF THE CERVIX

Radium is the most valuable therapeutic agent at our command in the treatment of advanced carcinoma of the cervix. Experience has shown that recurrences following operation or radium treatment are not as amenable as primary growths. In the early and distinctly operable stage, radium treatment cannot yet be regarded as the procedure of choice.

The best treatment for early and distinctly operable cases at the present time seems to be operation immediately following radium treatment of the carcinomatous area. This immediate preparatory treatment with radium is supposed to affect some of the cancerous cells beyond the operative area, and possibly also to prevent lymphatic dissemination.

In borderline cases, that is, those in which the disease has evidently passed through the cervix on one side, but in which the uterus retains enough mobility to encourage the operator to remove it, radium alone should be used.

Operation some time after radium treatment, the treatment having been given for the purpose of rendering inoperable or borderline cases operable, and which has been advised and practised, is not to be encouraged. Radiation renders the operation technically difficult, and the operation subjects the patient to the risk of disseminating quiescent and walled-off cancerous cells.

Radium treatment is the most effective treatment for recurrences after operation, but after all, it is not very successful. Nevertheless, in even the most hopeless cases, it may be of the utmost benefit short of a complete cure. Radiation is the treatment *par excellence* in cases of cancer of the cervix that are advanced and inoperable at the time they come under observation, but there are cases in which the disease is so far advanced locally that destruction of the carcinomatous growth will produce rectal or vesical fistula without any hope of permanent benefit. Curiously enough, even in some cases which present distinct metastases at a distance, radium treatment may be considered justifiable for the purpose of relieving disagreeable local manifestation.

In carcinoma of the cervix, radium treatment is supplied by the introduction of the radium salt or of the radium emanation directly into the cancerous area. In no case should radium treatment be preceded by curettement. No disturbance of the carcinomatous mass is permissible further than the use of a cautery knife, and this only when it is necessary to make room for the radium tube or to secure tissue for histologic diagnosis. When needles are available, they may be plunged directly into the mass. The radium salt or emanation should be introduced into the center of the carcinomatous tissue. The dose should be at least 2000 mg. hours. It is not practicable to use less than 50 mg. of radium in the treatment of cancer of the cervix.

The usual dose, as, for example, that used by Clark, is 100 mg. of radium screened with platinum and rubber, with an exposure of twenty-four hours. The rectum and bladder are protected by malleable lead plates, or by gauze packing which holds the vesicovaginal and the rectovaginal wall at some distance. Kelly and Burnham use a larger amount of radium element for shorter periods of time, as, for example, as much as 500 mg. for eight hours, to 3000 mg. for one hour. Miller uses 75 to 85 mg. of radium intermittently, giving from 3000 to 5000 milligram hours within a week or ten days.

When radium is used, the vesicovaginal and rectovaginal septa must be protected by suitable screens of lead or gold. These tissues may be protected also by the interposition of gauze packing which separates them from the radium. Distance is a good protector, the effect of radium on tissues being inversely as the square of the distance. If the vesicovaginal and rectovaginal walls are not sufficiently protected, cystitis, proctitis, ulceration, fistula formation, and infection may ensue.

More than half of the cases are benefited: hemorrhage, discharge, and pain disappear; the appetite improves, the color returns, and the patient gains in weight. In most cases this improvement lasts for at least six months, when the pain, emaciation, etc., reappear. Although nothing may be noted at the immediate original site of the cancer, upon making bimanual examination extensions from it may be discovered in the broad and uterosacral ligaments and in the rectovaginal and the vesicovaginal septa (Clark).

In some cases the general and local indications of the disease disappear for a longer period. In those extending over a period of five years, the result may be considered a cure. Kelly and Burnham report one case alive after seven years and six after six years.

The use of radium is too recent to warrant an estimate as to the durability of its effects.

Of Kelly and Burnham's series of 327 cases one is alive after seven years, six after six years, three after three years, 19 after two years, 22 after one year, etc.

Clark reports a total of 209 cases. Seventy-three are living: one after five years, four after four years; 11 after three years; 23 after two years, and 34 after one year. Twenty-five could not be traced; 111 are dead.

Recasens, in a series of 200 cases treated with radium and the Röntgen ray, claims to have secured 70 per cent. of relief for the inoperable cases,

and 100 per cent. relief for the operable cases. He speaks of the condition as a "clinical cure," but only 27 of his cases at the time of his report (1917) were of more than two years' duration and but 45 were more than one year old.

Kelly and Burnham, Recasens, and others advise a combination of radium and the Röntgen ray, the applications being made externally, through the abdomen or through the sacrum by cross-firing through several ports of entry. Case calls attention to the fact that the Röntgen ray is a

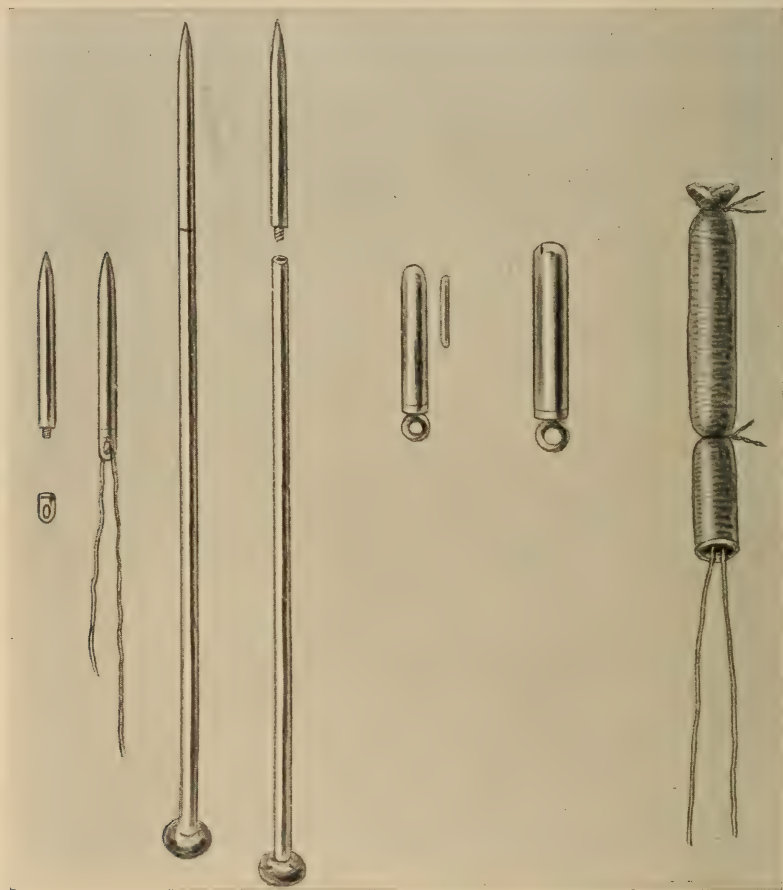


FIG. 526.—Means of applying radium in gynecological diseases; to the left, needles containing radium which may be thrust into malignant tumors; to the right, radium enclosed in platinum capsules and encased in rubber tubing, ready for intrauterine application.

much more powerful agent than radium in proportion to the time consumed. Radium is to be used in the uterus where it can be applied more directly to the cancerous area, whereas the Röntgen ray, directed from the outside, affects the deeper tissues and lymphatics that have escaped the influence of the radium.

A repetition of the radium application may be undertaken within a period of from four to eight weeks.

The Röntgen ray applications are made in series of séances conducted about three to four weeks apart.

CARCINOMA OF THE FUNDUS

The results of operation, except in advanced cases, are so good that dependence upon radiation is not often justified. It should be used only as a palliative measure in advanced inoperable cases or when there is some grave counter-indication to hysterectomy.

MYOMATA UTERI

The application of either radium or the Röntgen ray will control the hemorrhage of myomata uteri, the growths in most cases being gradually reduced in size and some finally becoming unrecognizable. In view of this fact and others, it might at first sight appear that radiation was the procedure of choice in the treatment of myoma uteri. This is not the case, for, while radiation is to be preferred for certain myomata, the majority of cases require operation.

The following are the disadvantages of radiation:

1. Although radiation arrests hemorrhage and tends to reduce the tumor, a nucleus of the latter may remain which later will give trouble.
2. Malignant complications may be overlooked either in the tumor itself (sarcoma) or in the endometrium (carcinoma). Myomata are sarcomatous in 2 per cent. of all cases; in 9 per cent. of submucous tumors. Although a diagnostic curettage can effectually rule out malignant degeneration in the endometrium, in many cases of myoma uteri there is such distortion of the uterine cavity that it is impossible to reach all parts of the endometrium with a curette. Frank insists that radiation is not permissible unless a thorough diagnostic curettage is possible.
3. Certain intrapelvic complicating lesions, such as adherent and closed adnexa, ovarian cysts, etc., may be overlooked; in a small proportion of cases these give trouble after radiation, and while they do not threaten life, a certain amount of morbidity must be entailed. Stein quotes many cases in which the Röntgen ray failed to reduce the tumor, and upon operation sarcoma, at times inoperable, was discovered. Tracy, in a collection of 3561 cases of myomata, estimated that 33 per cent. could not have been cured by the Röntgen ray because of malignant degeneration and adnexal lesions.
4. In young women radiation may destroy or seriously impair the reproductive functions. While the condition of the patient may be such as to make this a secondary consideration, in most instances it is a most important matter. When the myomata are single or pedunculated, myomectomy removes the growth without mutilation of the pelvic organs or impairment of their function.
5. While the effect of radiation on hemorrhage in myomata is in any case sufficiently prompt, when the growths are producing serious pressure symptoms, as, *e.g.*, vesical and ureteral obstruction, with cystitis and pyelitis, etc., it may be inadvisable to wait for the shrinkage of the radiated growths, as this may cover a period of months or even years.

6. When myomata are complicated by inflammatory adnexal lesions or ovarian tumors, radiation is inadvisable for two reasons: First, because radiation sometimes renders them worse, and secondly, because it never effects a cure.

7. When myomata are necrotic, radiation tends to aggravate the condition by predisposing to infection and diminishing the blood supply.

The advantages of radiation are as follows:

1. There is practically no operative mortality: in Röntgen ray cases there is no anæsthesia risk; there are no post-operative complications. The patient is ambulant, and there are fewer hospital days. While in a selected series of cases the risk of operation has been as low as or lower than 1 per cent., Kelly draws attention to the higher death-rate in general following operations for myomata, and also to the morbidity that follows operations. He thinks, therefore, that radiation by radium is the procedure of choice.

2. Radiation for the control of hemorrhage can be used with success and without hesitation in any patient, no matter how serious her condition.

3. If radiation fails, operation may later be undertaken without detriment to the patient. Pfahler observes that in 1915 from 2000 to 3000 fibroid cases had been treated by the Röntgen ray. If, later on, malignant degeneration were common, many cases would by this time have been reported in the literature. Furthermore, since radiation is successful in curing some inoperable carcinomata, why may it not be curative of unsuspected malignant growths?

4. The menopausal symptoms after cure by radium treatment are not so marked as after operation with complete ablation of the ovaries.

The consensus of opinion to-day among gynecologists in this country is that, in a majority of cases operation is to be preferred to radiation, and that the latter should be reserved for those in whom the advantages to be gained by operation are overbalanced by the dangers incident to the patient's condition.

Radiation is admittedly not suitable for complicated cases (*e.g.*, degenerations of tumor, endometrial disease, adnexal lesions), and it is in these cases that the operative mortality is highest. In the uncomplicated cases the operative mortality is exceedingly low (less than 1 per cent.); the patient is permanently cured, and there is no danger of a subsequent growth or of degeneration of the shrivelled remains.

Radiation is, therefore, reserved for:

1. Myomata in which the preponderating symptom is hemorrhage; especially in intramural tumors, when the uterus is smaller in size than a four months' pregnancy (Clark), and all parts of the endometrium may be reached in a diagnostic curettage.

2. Myomata complicated by anæmia, organic heart disease, diabetes, chronic nephritis, serious pulmonary disorders, goitre with heart symptoms, and other general lesions that increase the risk of operation.

Radiation is contraindicated:

1. When myomectomy is possible without impairing the reproductive functions.

2. When the dominating symptoms are due to pressure and the uterus is larger than a four months' pregnancy; especially in multiple tumors of the

submucous and the subserous type, as well as in a degenerating tumor or tumors complicated by adnexal lesions, or in cases in which these factors cannot be excluded.

Radium is the form of radiation that is particularly useful, since it can be introduced directly into any part of the uterovaginal canal. Radium should, therefore, be used as a rule, but in extremely large growths the Röntgen ray may be used with advantage to supplement the action of the radium; when the latter is not available, the Röntgen ray is an almost equally efficient alternative, although not so convenient or so rapid in its effect.

The results of radium treatment have been gratifying. Kelly and Burnham state that, in their opinion, with increasing experience 90 per cent. of myomata may be dissipated by radium without serious discomfort or risk. They report 210 cases in which the age ranged between 26 and 67. In some the tumor reached almost to the umbilicus. In nearly every case shrinkage or disappearance followed in from two to 18 months. Clark and Keene, Miller, and others report similar results.

The technic of application varies. Kelly and Burnham believe in giving large doses over a short period of time. They use, as a rule, a single intra-uterine dose of 1500 *millicurie* hours. Extremely large tumors are also attacked by supplementary massive treatment through the abdominal wall.

Clark and Keene, and Miller use 50 mg. of radium, screened by a platinum capsule and a rubber sheath, for 24 hours. This is a most successful and rational plan of treatment. A preliminary curettage is performed under local, nitrous oxide and oxygen, or ether anæsthesia. The depth of the uterine cavity is then measured, and the radium capsules, in either single, double, or tandem formation, are inserted to the fundus. Care must be taken not to allow the radium to remain in contact with the cervical canal. Nausea and sometimes lower abdominal pain and tenderness follow, as a rule, but in a majority of cases subside rapidly after removal of the radium. In some cases these symptoms may persist for a few days.

Radium produces its effect by causing an obliterative endoarteritis affecting the endometrial vessels; there may also be an influence upon the ovaries (destruction or inhibition of follicular development), but this is somewhat doubtful from an intrauterine application. To affect the ovaries Boggs applies 25 mg. of radium to the vaginal vault on each side of the cervix.

Following the use of radium, bleeding is checked and may not return; sometimes there is increased hemorrhage for a time, or the bleeding may be irregular. If the first application does not produce the desired result, a second application may be made after a period of several months. Following the use of radium, a slight irritating leucorrhœa may occur for a time.

The Röntgen ray may be used as supplementary to radium or, when radium is not available, it may be used alone.

Deep therapy, cross-firing, and filtration are necessary. Definitely localized single myomata may be treated directly, the ovaries being screened for protection.

There is no danger to the skin when the correct technic is carried out

and there is no visceral disturbance. Constitutional symptoms, such as lassitude, etc., are due to the absorption of gases that collect about high-tension currents.

Lange, who believes that malaise, nausea, anorexia, glandular enlargements, and metallic taste are due to acidosis, prescribes 30 grains of sodium bicarbonate every three or four hours. The proper ventilation of the treatment room is of the utmost importance (Pancoast).

HEMORRHAGIC UTERI

Almost every form of benign uterine hemorrhage is favorably influenced by radium treatment. Under this heading may be grouped hemorrhages due: (1) To myopathic changes; (2) to glandular hyperplasia of the endometrium; (3) to functional disturbances of the ovary or ductless glands; (4) to general diseases, such as heart, kidney, and liver disorders, circulatory lesions, etc.

These hemorrhages may either threaten life, by producing anæmia, or they may merely be a constant source of annoyance.

Radium is more satisfactory than the Röntgen ray for the reason that it can be applied in conjunction with a diagnostic curettage and because its effect is produced locally upon the capillaries of the endometrium, whereas the Röntgen ray must first influence the ovary and secondarily the circulation of the uterus. One radium treatment is usually sufficient.

Kelly and Burnham, Clark and Keene, and Miller, have used radium with success in these cases, and together report upward of 72 cases. There are two plans of applying the radium. Kelly and Burnham use a tiny capsule of radium emanation (500 to 1000 mc.) which is fastened to the end of a uterine sound. The emanation bulb is then placed in contact with successive areas of the uterine interior for a certain number of minutes at a time. The patient is maintained in position by means of pillows placed under the knees and by sand-bags placed on each side. The sound is kept in position by strapping it to sand-bags placed between the patient's knees. When a 500 mc. application is used there should be eight areas, and the application to each one should last fifteen minutes. When these observers consider complete and rapid cessation urgent, in addition to the internal radiation they make external applications, 1 gm. of radium being placed on either side of the lower abdomen over the true pelvis, 3 inches from the skin, and allowed to remain for from four to six hours.

External Röntgen ray treatment also may be used in conjunction with internal radium treatment.

Clark and Keene, and Miller apply the radium element or salt to the uterine cavity, screened with a platinum capsule and a rubber tube. The radium capsules are placed in single, double, or tandem formation, depending on the strength of the capsules, the dose, and the length of the endometrial cavity beyond the internal os.

When the hemorrhage is serious and the patient is over forty, and it is immaterial whether or not the menopause is induced, 50 mg. are used with twenty-four hours' exposure. In young women, when the symptoms are

less urgent and it is undesirable to produce a permanent amenorrhœa or a premature menopause, a dose of from 25 to 50 mg. is used, and the exposure lasts from three to eight hours.

Radium treatment should, in all cases, be preceded by a diagnostic curettage, otherwise it is not permissible. In the presence of adnexal lesions radium treatment is contraindicated, for it often aggravates them.

Cessation of the bleeding is usually prompt, but occasionally there are one or two free periods following the treatment; this, too, even if complete cessation of the periods has been desired and is subsequently accomplished.

It has been stated that radium treatment with a larger dose and for a shorter period is followed by less abdominal tenderness, also a diminution in the watery leucorrhœa that is almost always observed for a time.

When complete and permanent amenorrhœa takes place, only one-third of the patients complain greatly of menopausal symptoms; one-third experience very slight discomfort, and one-third complain of no discomfort whatever.

CARCINOMA OF THE VULVA

There is some reason to doubt the efficacy of radium in the treatment of vulvar growths. In one case in which a carcinomatous area in the labium majus was excised, with implantation in the wound of 50 mg. of radium for eight hours, a carcinomatous superficial inguinal gland was removed, and an enlargement of the deep inguinal glands was exposed to the Röntgen ray, improvement occurred and there was no recurrence after eight months. Another extensive (3 by 5 cm.) carcinoma of the labium majus, treated by radium alone, grew rapidly worse. The only patient in Janeway's series did badly, in spite of the fact that the lesion did not seem far advanced (1½ inches in diameter). Duane and Greenough treated three cases of vulvar carcinoma without securing any improvement.

No doubt in malignant tumors of the vulva operation is the procedure of choice, applications of radium being made later to prevent recurrence. Nevertheless, in late inoperable cases, radium is the only recourse, and should always be tried. Sarcoma of the vulva, especially of the melanotic type, rodent ulcer, and lupus vulvæ may be favorably influenced. Pruritus vulvæ is rapidly and favorably influenced by radium in many instances (50 per cent. cured, 25 per cent. improved, 25 per cent. unimproved) (Pancoast). The Röntgen ray is also useful here, as reported by Steiger, who treated pruritus ani by the same method.

PAPILLOMATA AND CARCINOMATA OF THE BLADDER

Geraghty has employed radium for the past two years in bladder papillomata that have shown histologic changes characteristic of malignant papillomata, or those in which the growths were unusually resistant to fulguration. There have been eighteen cases, seven of them multiple. Two patients discontinued treatment, but in the remaining sixteen the tumors were completely destroyed. In all but one cystoscopic examinations had been made subsequently, and four recurrences were noted. Six other cases of the malignant papilloma

type that had responded only slightly to fulguration, after varying amounts of radium, yielded readily to the high-frequency current.

In twenty-four cases of papillary carcinoma Geraghty concluded that radium was of no use, either alone or in combination with fulguration.

Barringer used radium in twenty-five cases of carcinoma of the bladder, of whom twenty-three were impossible operative risks. In four (three confirmed as cancer by microscopic examination) radium removed the growth locally (ten and one-half months, five months, and less), and one showed slight symptoms of local recurrence, the microscopic examination, however, being negative. Of the twenty-one remaining cases, eight had died at the time of his report (1918); two were improving, one was hopeless, one had shown some indication of having been benefited; four had not been heard from, and the remainder were too recent (1917) to be conclusive.

Geraghty employed about 103.7 mg. of radium in a brass capsule (sometimes the β -rays were filtered with platinum). The capsule was introduced in the beak of an instrument through which an observation cystoscope could be passed. After accurate placing of the radium, the instrument was held in a fixed position by means of a mechanical arm attached to the cystoscope table. The radiations were given for an hour at a time, and the séances were repeated from one to three times weekly, depending upon the tumor and the reaction of the patient.

Barringer's plan was to introduce the radium tubes (emanation screened with silver and rubber, 50 to 100 mc.) into the bladder through a cystoscope. As most tumors are situated in the trigone, the patient was placed in the recumbent posture and the radium was kept in close contact with the growth. If the growths were in the vault or upon one of the lateral walls, the patient was placed upon the abdomen or upon one or the other side.

Hirst and Pancoast have one patient who had an extensive papillary carcinoma involving the base of the bladder upon whom they did a suprapubic cystotomy, and then with free exposure of the growth, used desiccation followed by radium treatment. She remains without symptoms and free, so far as they are able to determine, of a recurrence of the tumor after three months.

In women suprapubic cystotomy and free exposure are advisable, as a rule, preliminary to fulguration and radium treatment.

RECTAL DISEASES

Both adenocarcinoma of the rectal mucosa above the sphincter region and squamous epithelioma of the anus have shown some susceptibility to radium treatment. Adenocarcinoma is definitely curable in rare instances and favorably influenced in a few cases. Radiation may be tried in early cases, when operation would mean serious mutilation. If radiation fails, operation can still be resorted to. The difficulty in the use of radium in the treatment of cancer of the rectum lies in the technic of its application; this difficulty is increased by the fact that the function of the bowel is of necessity more or less continuous. A satisfactory plan is to expose the entire tumor-bearing area through a speculum. A piece of

muslin containing the radium tubes is then introduced and spread over the tumor. Over this sufficient gauze packing may be placed to push away and protect the opposite rectal wall. A more exact method consists in making a cast of the cavity of the rectum out of dental composition and embedding the radium tubes on its surface in contact with the lesion; or a disk containing the radium may be attached to the proctoscope and applied, under direct observation, to the tumor.

In advanced annular carcinomata of the rectum, after performing colostomy, a string may be washed through the rectum out of the anus, and by this means radium tubes may be drawn through into successive positions in order to expose every part of the affected bowel.

The technic of application in epithelioma of the anus is simple. These tumors are more malignant and less amenable to the treatment than adenocarcinoma. Metastases from the anus to the inguinal lymphatic glands is a factor that exerts an unfavorable influence on the prospects of cure. Janeway reported thirty-four cases of cancer of the rectum treated with radium. Two had completely retrogressed and showed no evidence of disease at the time his report was made (1917); fourteen had been improved, whereas eighteen were classed as unimproved.

ABDOMINAL TUMORS

Burnham and Kelly report that immense growths of this type have completely disappeared under radium treatment. Favorable results also were observed in colloid carcinoma of the intestine, cancer of the liver and stomach, ascites from abdominal cancer, hypertrophy of the spleen, and sarcoma of the kidney.

One case of bilateral papilocarcinoma of the ovary with diffuse peritoneal metastases has been observed in which, after removal of the pelvic tumors and recurrence of tumor formation and ascites in the abdomen, the Röntgen ray caused a recrudescence of the abdominal masses and disappearance of the ascites for a period of two years. The ascites then reappeared and in spite of repeated tapplings and Röntgen ray treatment the patient died within a year.

In the treatment of such conditions with radium immense quantities are required, so that the treatment is available in few localities. Röntgen ray treatment is more generally applicable in these cases.

BIBLIOGRAPHY

- ABBE, R.: "Uterine Fibroids, Menorrhagia, and Radium." *Med. Record*, 1915, lxxxvii, 379.
BAILEY, H.: "Radium in Uterine Cancer." *Trans. Amer. Gyn. Soc.*, 1917, xlii, 438.
BRETTAUER, J.: "Final Results of Röntgen Ray Treatment of Fibroids of the Uterus." *Trans. Amer. Gyn. Soc.*, 1918, 364.
BURNHAM, C. F.: "A Brief Outline of the Status of Radium Therapeutics." *Bull. J. H. H.*, 1915, xxvi, 190.
CASE, J. T.: "The Röntgen Treatment of Uterine Carcinoma." *S., G. and O.*, 1916, xxii, No. 4, 429; *Ibid.*: "The Present Status of Röntgentherapy in the Management of Deep-seated Malignancy." *S., G. and O.*, 1917, xxiv, No. 5, 580; *Ibid.*: "Röntgen Therapy." *P. M.*, 1918, 171.
CLARK, J. G.: "The Therapeutic Use of Radium in Gynecology." *S., G. and O.*, June, 1918.
CLARK, J. G., AND KEENE, F. E.: "The Use of Radium in Cases of Benign Uterine Hemorrhage." *Trans. Amer. Gyn. Soc.*, 1917, xlii, 424.

- COLE, C. G.: "Technic and Experimental Application of Hard Rays for Deep Röntgen Therapy." Trans. Amer. Gyn. Soc., 1915, xl, 215.
- DUANE AND GREENOUGH: "Report of Results of Radium Treatment at the Collis P. Huntington Memorial Hospital by the Cancer Commission of Harvard University." Boston Med. and Surg. Jour., 1917, clxxvii, 359.
- FRANK, R. T.: "X-Ray Treatment of Uterine Hemorrhage." Trans. Amer. Gyn. Soc., 1916, xl, 460; *Ibid.*: S., G. and O., 1916, xxiii, 243.
- HEYDEMANN, TH.: "Gynäkologische Strahlentherapie." Therap. Monatschrift, 1915, xxix, 78.
- JANEWAY, BARRINGER AND FAILLA: Radium Therapy in Cancer. Hoeber, New York, 1917.
- KELLY, H. A.: "Radium Therapy in Cancer of the Uterus." Trans. Amer. Gyn. Soc., 1916, No. 41, 532; *Ibid.*: "Methods and Results of Radium Treatment of Uterine Hemorrhage Due to Other Causes Than Malignancy." Trans. Amer. Gyn. Soc., 1917, xlii, 408; *Ibid.*: "The Radium Treatment of Fibroid Tumors." S., G. and O., 1915, xx, 271.
- KELLY, H. A., AND BURNHAM, C. F.: "Radium in the Treatment of Uterine Hemorrhage and Fibroid Tumors." Trans. Sect., O., G. and A. S., A. M. A., 1914, 237; *Ibid.*: "Radium in the Treatment of Carcinomas of the Cervix Uteri and Vagina." J. A. M. A., 1917, lxxv, 1874; *Ibid.*: "Two Hundred and Ten Fibroid Tumors Treated by Radium." Trans. Amer. Gyn. Soc., 1918, 317.
- LANGE, S.: "The Cause and Prevention of the Constitutional Symptoms Following Deep Röntgentherapy." Amer. Jour. Röntgenology, 1916, iii, 356.
- MILLER, C. J.: "Radium in the Treatment of Carcinoma of the Cervix Uteri." S., G. and O., 1916, xxii, No. 4, 437; *Ibid.*: "Radium in the Treatment of Certain Types of Uterine Hemorrhage and Uterine Fibroids." Trans. Amer. Gyn. Soc., 1917, xlii, 377.
- PFAHLER: "Röntgenotherapy in Uterine Hemorrhage." Trans. Sect., O., G. and A. S., A. M. A., 1914, 251; *Ibid.*: Röntgen Therapy in Uterine Fibroids and Uterine Hemorrhage." Trans. Amer. Gyn. Soc., 1915, xl, 199.
- PFAHLER, G. E.: "Röntgenotherapy in Uterine Fibroids and Uterine Hemorrhage." Amer. Jour. Obst., 1915, lxxii, 79.
- PFAHLER and MCGINN: Röntgenotherapy Successful in Uterine Fibroid Without Affecting the Ovaries." Amer. Jour. Obst., 1917, lxxvi, 262.
- PRIME: "Radium and Cancer Experimental Work." Prog. Med., 1918, 163.
- RECASENS, S.: "La Radiumtherapie dans le cancer de l'utérus." Arch. mens. d'obst. et de gyn., 1917, 34.
- SCHMITZ, H.: "An Additional Contribution to the Therapeutic Value of Radium in Pelvic Cancers." S., G. and O., 1916, xxiii, No. 2, 191.
- STEIGER, M.: "Bisherige Erfahrungen und Resultate aus dem Röntgeninstitut der Universitätsfrauenklinik." Bern. Cor.-Bl. f. Schweiz. Aerzte, 1915, February 27, xlv, 257.
- STEIN, A.: "The X-Ray Treatment of Uterine Myomata—A Warning Based on a Study of the Literature." Med. Record, Wm. Wood & Co., New York, 1916, lxxxix, 991.
- SHOEMAKER, G. E.: "Sarcomatous Degeneration of a Uterine Fibroma Five Years After Röntgen Ray Treatment for Pressure and Hemorrhage." Jour. Amer. Med. Assoc., 1915, lxiv, 1653.
- TRACY, S. E.: "A Report of 100 Consecutive Cases of Fibromyomata Subjected to Operation." Trans. Sec., O., G. and A. S., A. M. A., 1916, 299.

CHAPTER XLI

VACCINE AND SERUM THERAPY IN GYNECOLOGY

SPECIFIC therapy—by vaccines and sera—in the treatment of gonococcus infections of the female pelvic organs has not achieved the marked curative results seen in other diseases. However, in many instances marked improvement of the lesion and amelioration of the symptoms has followed the use of specific measures either alone or used to supplement appropriate local treatment.

Injection of specific serum has not been in frequent use, due to the difficulty in most cases of establishing the exact identity of the causative organism. Sera for gonococcus infections are usually prepared by immunizing rabbits and sheep. They should not be used during the acute period of the disease, the so-called negative phase of the infection, but better later when the patient is not so overwhelmed with toxins, yet still has a moderately active infection. The serum confers a passive immunity rather than an active one. The dosage may vary from 20 to 100 c.c. given every twenty-four hours or more. In general it may be said that the serum is more efficacious in such complications as arthritis, endocarditis, and general septic conditions associated with gonococcus infections of the genito-urinary tract than in the treatment of the simple forms of gonococcal urethritis, vulvitis and cervicitis.

Auto Serum Therapy.—In the treatment of gonorrhœal arthritis good results have followed the injection of 5 to 10 c.c. of the patient's own serum.

Vaccine therapy of gonococcus infections of the female pelvic organs has shown different results in the hands of various observers. Vaccines may be autogenous, polyvalent, or mixed, *i.e.*, with other organisms. The gonococcus is hard to cultivate. It grows best in original culture on hæmoglobin or hydrocele fluid agar. After once establishing the growth the gonococcus will grow readily upon most media. Naturally an autogenous vaccine is to be preferred. But lacking this, and due to the variances in the different strains of the organism, it is advisable to use a polyvalent or stock vaccine. In some instances a mixed vaccine is of value, when to the polyvalent gonococcus vaccine is added various combinations of vaccines, such as colon bacillus, micrococcus catarrhalis, staphylococci and diphtheroid bacilli. Whatever the nature of the vaccine it should always be used as a complement to the necessary and appropriate local therapeutic measures.

Vaccines have been used extensively in the vulvovaginitis of children. The poor results from vaccines in the hands of some observers may be due, as Louise Pearce has shown, to the fact that the organism found on the vulva of infants differs immunologically from the organism found in adult urethritis. Here, preferably, an autogenous vaccine should be used. In the treatment of leucorrhœa, vaginitis, and cervicitis, Curtis found that vaccine therapy gave very satisfactory results for a time. A considerable number showed decrease in the discharge while under treatment without attainment

of a point of absolute cure. Many had a slight return of discharge on cessation of treatment. Most important in his investigation was the cure or relief of such associated symptoms as malaise and backache when an autogenous vaccine was used. Vaccines have not been used in sufficient degree in salpingitis, oöphoritis, or metritis to warrant conclusions being drawn as to their therapeutic value. In the treatment of arthritis, which frequently complicates gonococcus infection of the genito-urinary tract, vaccines have proved to be valuable adjuncts.

The dosage should be from 50 to 100 million every three to five or six days, and may be increased to as high as 500 millions. Reactions should be looked for, and may occur as local, focal, or general. In case of a severe reaction of any nature the dose should be cut in half for the next injection and treatment continued cautiously. The local reaction has been made use of at times as a diagnostic means. A few drops of a gonococcus vaccine are injected intracutaneously after the manner of producing the well-known tuberculin reaction. A positive reaction is manifested by the appearance in from twenty-four to thirty-six hours of a small papule at the point of injection, surrounded by an areola of erythema. This disappears in a few days. A negative reaction is a slightly yellowish discoloration at the point of injection. A diagnostic focal reaction following a subcutaneous injection might be expressed by lessened tenderness and softening of the mass, as in a pelvic lesion.

In general, it may be said that vaccines and sera are often valuable aids to treatment and merit extended use in many cases (see also Treatment of Puerperal Pelvic Inflammatory Disease, p. 424).

BIBLIOGRAPHY.

- CURTIS, A. H.: "On the Pathology and Treatment of Chronic Leucorrhea." *Surg., Gyn. and Obst.*, 1914, vol. xix, 25.
- HAMILTON, B. W.: "Gonococcus Vulvovaginitis in Children." *Jour. Am. Med. Assn.*, 1910, liv, 1196.
- HENSIUS, F.: "Versuche zur Vaccine Behandlung der weiblichen Gonnorrhoe." *Monatschr. f. Geburtsh. u. Gynäk.*, 1911, xxxiii, 426.
- MORROW, L., and BRIDGMAN, O.: "Gonorrhoea in Girls, Treatment of Three Hundred Cases." *Jour. Am. Med. Assn.*, 1912, lviii, 1564.
- NEU: "Vakzinetherapie." *Monatschr. f. Geburtsh. u. Gynäk.*, 1913, xxxviii, 182.
- STERNBERG, A. J.: "Zur Vakzindiagnostik der Gonorrhoe des Weibes." *Gyn. Rundschau*, 1912, vi, 701.
- TAUSSIG, F. J.: "The Prevention and Treatment of Vulvovaginitis in Children." *Am. Jour. Med. Sci.*, 1914, cxl.
- WEINSTEIN, E.: "Die Vakzinetherapie nach Wright bei der Vulvovaginitis der Kinder." *München. med. Wochenschr.*, 1910, lvii, 762.

INDEX

A

Abderhalden serum test in pelvic disease, 107
 Abdomen, examination of, 131, 520
 exploration of, 639
 mensuration of, 137
 pendulous fat, 550
 treatment of, 551
 regions of, 116
 Abdominal, bandages, 696
 binder, 696
 examination, 131, 520
 by auscultation, 137
 by palpation, 131, 132
 by percussion, 134
 hysterectomy, 317
 incisions, 624
 Battle's, 505, 625, 626
 closing, with drainage, 646
 directions regarding, 633
 dressing, 646
 gridiron, 627
 high paramedian, 625
 lateral, 625
 local anæsthesia in, 652
 low paramedian, 624
 operations, preparations for, 621
 organs, remote from pelvis, 137
 ptosis, 508, 550
 support, 551, 696
 tumors, radium in, 723
 viscera, diseases of, 500
 associated with pelvic disorders, 500
 exploratory laparotomy for, 639
 related to pelvic disorders, 500
 wall, 60
 examination of, 520
 relaxation of, 550
 treatment of, 551
 Abortion, 80, 95
 in relation to pelvic disease, 95
 tubal, 371
 Abscess, of appendix, 500
 of Bartholin's gland, 186
 of incision, post-operative, 689
 of kidney pelvis, 471 (*see also Pyelonephritis*)
 of ovary, 381
 of pelvis, 428, 690
 of uterus, intramural, 282
 suburethral, 445
 tubo-ovarian, 365
 Acidosis, in operative cases, 619
 post-operative, 693
 diagnosis of, 692
 etiology of, 692
 symptoms of, 692
 treatment of, 693

Acute gastric dilatation, diagnosis of, 683
 etiology of, 682
 symptoms of, 682
 treatment of, 683
 Addison's disease, and amenorrhœa, 581
 in relation to generative organs, 581
 Adeno-carcinoma of uterus, 331, 343 (*see also Carcinoma of Cervix and Carcinoma of Body of Uterus*)
 Adenocystoma of kidney, 481
 Adenomyoma, of Fallopian tube, 326
 of recto-vaginal septum, 327
 pathology of, 327
 symptoms of, 327
 treatment of, 328
 of uterus, diagnosis of, 328
 etiology of, 12, 326, 327
 histology of, 327
 pathology of, 327
 symptoms of, 327
 treatment of, 328
 origin of, 12
 Adeno-myosis uteri, 326
 Adenomyositis uteri, 326
 Adhesions, pelvic, treatment of, 641
 Adnexitis, acute, differential diagnosis of, from acute appendicitis, 414, 501
 chronic, differential diagnosis of, from chronic appendicitis, 503
 Adolescence, hygiene of, 609
 Adrenal gland, extract of, in shock, 670
 in relation to genital organs, 64
 Adrenal tumors of kidney, 481
 Age, in relation to history of pelvic disease, 91
 Alexander operation, in retroversion of uterus, 254
 technic of, 260
 Amenorrhœa, a symptom of pelvic disease, 98
 etiology of, 580
 factors in, anatomic, 580
 constitutional, 581
 psychic, 581
 general considerations of, 580
 pseudo, 580
 treatment of, 581
 Amputation of cervix, 234, 235, 236
 Anæmia, in myomata of uterus, 303, 306, 310, 616
 in pelvic disease, 87, 106
 risks in operative cases, 615
 treatment of, 616
 Anæsthesia, chloroform in, 649
 combined local and general, 650
 ether in, 649
 ethyl chloride in, 650
 examination of pelvis under, 112, 610
 general considerations of, 649
 local, 650

- Anæsthesia, local, by ethyl chloride, 652
 cocaine in, 650
 eucain in, 650
 solutions for producing, 650
 technic of, in cervix operations, 651
 in celiotomy incisions, 651
 in hysterotomy, 651
 in vaginal operations, 651
 in vulvar incisions, 651
 morphine in, 650, 652
 nitrous oxide and oxygen, 650
 oxygen and ether, 650
 spinal, 652 (*see also Spinal Anæsthesia*)
- Anal, fissure, 522
 fistula, 524
- Anastomosis of intestine, 518, 679, 681
 of ureter, 468
- Animal inoculation in tuberculous disease of
 kidney, 111
 in tuberculous cystitis, 456
- Anoci association of Crile, 617, 651
- Anteflexion of uterus, 237, 239 (*see also*
Uterus, Pathologic Anteflexion of)
 in dysmenorrhœa, 587
- Anterior colporrhaphy, 218
- Antigonococcic serum, 725
 vaccine, 725
- Antistreptococcic serum, 424
- Anus, anatomy of, 45
 diseases of, 522
 examination of, 162
 by inspection, 163
 by palpation, 162
 by specula, 163
 position for, 162
 preparation for, 162
 malformations of, 21
 abnormal communications, 21
 situations, 21
 absence of, 21
 imperforate, 21
 treatment of, 29
- Appendicectomy, 505
- Appendicitis, acute, 414, 501
 differential diagnosis of, from acute
 adnexitis, 414, 501
 involvement of, in pelvic disease, 500
 symptoms of, 502
 treatment of, 502, 505, 656
 chronic, Bastedo's sign in, 504
 diagnosis of, 503
 differential diagnosis of, from
 chronic adnexitis, 503
 pathology of, 503
 symptoms of, 503
 treatment of, operations in, 505
 during pregnancy, 656
 Cæsarean section in, 656
 Gerster's plan in, 656
 operations in, 656
 suppurative, differential diagnosis of,
 from salpingitis, 414, 501
 drainage in, 660
 relation to pelvic disease, 96
- Appendix, inflammation of, acute, 500
 chronic, 503
- Applications, to Bartholin's gland, 698
 to cervix, 698
 to endometrium, 697
 to Skene's tubules, 700
 to urethra, 700
 to vagina, 698
- Arseno-benzol, in treatment of puerperal
 pelvic inflammatory disease, 424
- Artificial, anus, formation of, 30
 insemination, 606
 menopause, 595
 vagina, formation of, 28
- Arthritis, gonorrhœal, 726
 toxic, etiology of, 550
 symptoms of, 550
 treatment of, 550
- Ascites, differential diagnosis of, from
 ovarian cyst, 391, 396
- Aspiration of cystic kidney, 485
- Atresia, 23, 28 (*see also Gynatresia*)
- Atropin in treatment of dysmenorrhœa, 590
- ## B
- Babcock's method of spinal anæsthesia, 653
- Backache, equilibrium in, 536
 etiology of, 536
 factors in production of, 536, 538
 foci of infection in, 538
 static, 538 (*see also Static Backache*)
- Bacteriology in cystitis, 453
 in pelvic inflammatory disease, 411
 in pyelitis, 486
 of generative organs, 88, 89
 of pelvis, 88
 of urine, 109
 diagnosis of, by guinea-pig inocula-
 tion, 111
 of vagina, 89
- Baldwin's operation for artificial vagina, 28
- Baldy's operation in prolapse of ovary, 410
 in retroversion of uterus, 256, 262
 hæmostasis in, 640
 technic of, 262
- Bartholin's glands, abscess of, 186
 treatment of, 186, 187
 anatomy, 33
 applications to, 698
 cyst of, 187
 inflammation of, 186
- Basedow's disease and amenorrhœa, 581
- Bastedo's sign in appendicitis, 504
- Benzyl benzoate in dysmenorrhœa, 590
- Beyea's operation for elevation of stomach,
 515
- Bimanual examination of pelvic organs, 127
- Biologic theory of carcinoma, 330
- Bladder, abnormal picture of, in cystoscopy,
 146
 anatomy of, 43
 atmospheric distention of, in cystoscopy,
 144

Bladder, calculus, 458
 capacity of, 43, 146
 carcinoma of, 460
 carcinomata of, radium in, 721
 care of, after operation, 665
 developmental anomalies of, 21
 absence, 21
 duplication, 21
 extrophy, 21
 fistula, 21
 treatment of, 27
 diseases of, 453
 distention of, by water, in cystoscopy, 145
 drainage of, 456, 660
 embryology of, 2
 incisions of, 456
 inflammation of, 453 (*see also Cystitis*)
 injuries to, 642
 interior of, in chronic cystitis, 147
 local anæsthesia in, 651
 mucosa of, 147
 color of, 147
 transparency of, 147
 new growths of, 459
 treatment of, 460
 orifices of, inspection of, 142
 palpation of, 138
 papilloma of, 460
 papillomata of, radium in, 721
 physiology of, 84
 picture of normal, in cystoscopy, 145
 pillars, 216, 217, 219, 220
 shape of interior of, 147
 stone, 458 (*see also Vesical Calculus*)
 tuberculosis of, 456
 ulcer of, Fenwick type of, 459
 Hunner type of, 459
 vessels of, 147
 number of, 147
 position of, 147
 size of, 147
 Block's test for tubercle bacillus in urine, 111, 456
 Blood count, in pelvic disease, 106
 culture in pelvic disease, 106
 examination of, in pelvic disease, 106
 in pelvic disease, 104, 105
 in peritonitis, 677
 methods of obtaining, for tests, 108
 pressure risks in operative cases, 616
 Crile's anoci association in, 617
 urea, methods for determining, 160
 test, 160
 Blood-vessels of generative organs, 54
 of pelvis, 54
 Bowels, post-operative care of, 664
 enemas for, 664
 Breast, in relation to generative organs, 65
 Brödel's white line in kidney, 484
 Bronchitis, post-operative, etiology of, 683
 symptoms of, 684
 treatment of, 684
 Byrne's treatment of carcinoma of cervix
 with cautery knife, 354

C

Cæsarean section in pregnancy with appendicitis, 656
 Calculus of bladder, 458 (*see also Vesical Calculus*)
 of kidney, 478 (*see also Renal Calculus*)
 of ureter, 489 (*see also Ureteral Calculus*)
 Canal of Nuck, 48
 hydrocele of, 187
 Carcinoma of bladder, 460
 diagnosis of, 460
 symptoms of, 460
 treatment of, 460, 461
 of body of uterus, 342
 diagnosis of, 344
 curettement in, 345
 digital exploration, 345
 instrumental exploration, 345
 microscopic examination in, 345
 extension of, 343
 lymphatic involvement in, 343
 myoma with, 343
 pathology, 342
 precancerous changes in, 343
 prognosis in, 345
 spread of, 343
 symptoms of, 344
 cachexia in, 344
 hemorrhage in, 343
 leucorrhœa in, 344
 treatment, 345
 hysterectomy, 345
 abdominal, 345
 vaginal, 345
 palliative measures, 346
 panhysterectomy in, 345
 preliminary treatment in, 345
 radium in, 717
 of cervix, clinical forms of, 334
 cauliflower, 334
 excavating, 335
 indurated, 335
 infiltrating, 335
 proliferating, 334
 ulcerating, 336
 vegetating, 334
 diagnosis of, 336
 by inspection, 338
 by microscopic examination, 338
 differential diagnosis of, from erosion and erosion, 338
 from myomata, 339
 from polyps, 339
 from sarcoma, 339
 from syphilis, 339
 from tuberculosis, 339
 extension of, 331, 332, 334
 involvement of lymphatics in, 332, 334
 of surrounding tissue in, 332, 334

- Carcinoma of cervix, metastasis of, 334, 335
 operability of, 340
 pathology of, 331
 columnar-cell type, 331
 squamous-cell type, 331
 prognosis in, 340
 American statistics, 340
 European statistics, 340
 five-year period, 340
 question of operability in, 340
 radium in, 714
 recurrence of, after operation, 342
 symptoms of, 342
 symptoms, 335
 hemorrhage, 336
 cause of, 336
 leucorrhœa, 336
 pain, 336
 treatment, 339
 destructive cauterization in, 353
 high amputation with cautery
 knife, 354
 hysterectomy, 340
 abdominal, 340
 vaginal, 340, 351
 with paravaginal in-
 cisions, 352, 353
 inoperable cases, 341
 cautery, 342
 Percy method, 341, 342, 350
 radium, 341
 Röntgen ray, 341
 operations in, 339
 panhysterectomy, 339, 349
 Percy method, 354
 technic of, 356
 of Fallopian tube, 368
 of ovary, 395 (*see also Ovary, Carci-
 noma of*)
 of rectum, 534
 diagnosis, 534
 etiology, 534
 symptoms, 534
 treatment, 534
 operations for, 534
 radium in, 534, 722
 varieties, 534
 of urethra, 451
 symptoms of, 451
 treatment of, 451
 Crossen's plan in, 451
 of uterus, etiology, 330
 age in, 330
 biologic theory in, 330
 childbirth in, 330
 heredity in, 330
 race in, 330
 relative frequency of, 330
 pathology, 331
 recurrence, 342
 relation to menopause, 594
 situation, 330
 of vagina, 196
 primary, 196
 treatment, 196
- Carcinoma of vulva, 181
 diagnosis, 182
 symptom, 181
 treatment, 182
 radium in, 721
- Cardiac condition in pelvic disease, 105
 complications in myomata of uterus, 303,
 306
 dilatation, post-operative, 690
 etiology, 690
 symptoms, 690
 treatment, 691
 risks in operative cases, 615
 anæsthesia in, 615
 complications in, 303, 306,
 615
 posture in, 615
 treatment of, 615
- Caruncle of urethra, 449 (*see also Urethral
 Caruncle*)
- Cases, record of, form for, 92
 Catgut, preparation of, for operation, 622
 Cathartics, use of, after operations, 665
 Catheter, bismuth, 156, 491
 self-retaining, 446
 shadow, 156
 styletted, 491
 ureteral, 143
 sterilization of, 143
 wax-tipped, 150
 Catheterization after operation, 666
 of ureters, 147
- Causes of pelvic disorders, 87
 acquired, 88
 congenital, 87
 evident at birth, 87
 at menopause, 87
 at puberty, 87
 in reproductive period,
 87
- Cauterization of cervix, 353, 354
 Cautery, electro, 704
 thermo, 704
- Cellulitis, pelvic, 430
 chronic, 432
 diagnosis, 432
 etiology, 432
 pathology, 432
 symptoms, 432
 treatment, 432
 pelvic massage in, 433
 vaginal tampons in, 433
 diagnosis of, 431
 etiology of, 430
 pathology of, 430
 symptoms of, 431
 treatment of, 432
- Cervix, amputation of, 234
 high, 234
 low, 234
 atresia of, 24, 28, 223
 carcinoma of, 331 (*see also Carcinoma of
 Cervix*)
 catarrh of, 227
 chancre of, 572

- Cervix, conical, 28
 cystic degeneration of, 228, 230
 dilatation of, 120
 diseases of, 223
 elongation of, 228, 229
 endometrium of, inflammation of, 223
 hyperplasia of, 223
 infections of, 223
 erosion of, 228
 eversion of, 227
 excision of, test, 121
 gonorrhœa of, 224
 hypertrophic elongation of, 229
 hypertrophy of, 229
 infection of, treatment of, 224
 lacerations of, 226
 amputation for, 234
 causes of, 226
 diagnosis of, 230
 results of, 227-229
 symptoms of, 229
 trachelectomy for, 234
 trachelorrhaphy for, 233
 treatment of, 231
 operative measures in, 232
 palliative measures in, 232
 varieties of, 226
 local applications to, 698
 Nabothian cysts of, 228
 obliteration of, in labor, 79
 in pregnancy, 79
 operations on, local anæsthesia in, 652
 polyp of, 225
 etiology of, 225
 symptoms of, 226
 treatment of, 226
 softening of, in pregnancy, 76
 stenosis of, 28
 treatment of, 28
 supravaginal elongation of, 267
 syphilis of, 572
 tuberculosis of, 566
 vaginal elongation of, 229
- Chancere of vulva, 174
 Chancroid of vulva, 176
 treatment of, 177, 178
- Childbirth, in relation to pelvic disease, 95
- Chloroform anæsthesia, 649
- Chromo-cystoscopy, by indigo carmine, 158
- Chromo-ureteroscopy, technic of method of, 159
- Chronic pelvic inflammatory disease, 428
 diagnosis of, 429
 etiology of, 428
 pathology of, 428
 symptoms of, 429
 treatment of, 430
- Chorioepithelioma of uterus, 346
 diagnosis, 348
 etiology, 347
 hydatidiform mole in, 347
 metastasis of, 347
 pathology, 346
 ovarian cysts with, 348, 404
- Chorioepithelioma of uterus, prognosis, 348
 situation of, 348
 abnormal, 348
 symptoms, 348
 hemorrhage, 348
 tumor, 348
 treatment, 349
 of vagina, 197
- Chorion, 73
 frondosum, 75
 villi of, 73
- Circulatory symptoms, in myomata, 302, 303,
 306
 in pelvic disease, 101, 105
- Clark's theory of histogenesis of ovarian
 cysts, 384
- Climacteric, 82, 94
- Clitoris, 33
- Coccygodynia, diagnosis of, 552
 etiology of, 552
 symptoms of, 552
 treatment of, 552
- Coccyx, injuries to, 552
- Coffey operation in retroversion of uterus,
 258
 technic of, 261
- Colon, disorders of, in intestinal stasis, 509
 operations on, 515
- Colopexy, 515
- Colporrhaphy, anterior, 216
 posterior, 209, 210, 213
- Complaint, chief, 91
- Complete tear of perineum, 202 (*see also*
Perineum, Injuries to)
- Condylomata acuminata, 178
 treatment of, 179
- lata, 175
 of vulva, 571
- Congenital causes of pelvic disease, 87
- Conservation of adnexa, 312, 324, 640
- Constipation, as symptom of pelvic disease,
 100 (*see also Chronic Intestinal Stasis*), 507
- Corpus luteum, 66
 cysts of, 403
 formation of, 70
 of menstruation, 69
 of pregnancy, 76
- Corsets, features of good, 696
 use of, 696
- Crile's anoci association, 617, 651
- Crossen's plan in carcinoma of urethra, 451
- Crown sutures, 209, 211, 213
- Curettement, diagnostic, 121
 findings in, 289
 in carcinoma of cervix, 339
 in endometritis, 280
 preservation of tissues from, 291
 results of, 289
 technic of, 289
- Curettings, preservation of, 291
- Cutaneous diseases of external genitalia, 166
- Cystadenoma of ovary, 384
- Cystic degeneration of ovary, 383
 tumors of kidney, 480

- Cystitis, 453
 acute, 453
 diagnosis of, 453
 etiology of, 453
 prognosis of, 454
 symptoms of, 453
 treatment of, 454
 bacteriology in, 453
 chronic, 454
 diagnosis, 455
 etiology, 454
 symptoms, 454
 treatment, 456
 operations in, 456
 drainage in, 660
 etiology of, 453
 post-operative, 690
 tuberculous, 456
 chromocystoscopy in, 456
 cystoscopic findings in, 456
 diagnosis of, 456
 animal inoculations in, 111, 456
 etiology of, 456
 symptoms of, 456
 treatment of, 458
 ureteral orifices in, 456
- Cystocele, diagnosis of, 216
 mode of production of, 202
 operations for, 216
 Goffe's, 220
 interposition of uterus, 220
 large cystocele, 220
 Martin's, 216
 Sänger's, 216
 Watkins', 220
 treatment of, 216
- Cystopexy, 216
- Cystoscopes, sterilization of, 143
- Cystoscopy, abnormal appearance of bladder in, 146
 appearance of bladder in, 145
 atmospheric distention of bladder in, 144
 direct method, 144
 distention of bladder by water in, 145
 general preliminaries to, 143
 in diagnosis of ureteral fistula, 465
 indirect method, 145
 in kidney functional tests, 158
 in tuberculous cystitis, 457
 Kelly's method, 144
 landmarks in, 144
 locating fixed anatomical points in, 145
 position for, 145
 ureteral calculus, 491
 urinary fistula, 465
- Cystotomy, 456, 459
- D**
- Decidua, 72
 cells, 72
 compacta, 72
 serotina, 75
 spongiosa, 72
- Deciduoma malignum, 346 (*see also Chorio-epithelioma of Uterus*)
- Defecation, difficult, in rectocele, 204
 mechanics of, 85
- Delayed menstruation, 580
- Dermoid cysts of ovary, 383
- Descensus uteri, 238
- Developmental anomalies of generative organs, 15
 defects in etiology of dysmenorrhœa, 587
 in etiology of sterility, 599
- Diabetes in pruritus vulva, 170
- Diagnostic curettement, 121
- Diet after operations, 664
- Dilatation of bladder, 145, 458
 cervix in treatment of dysmenorrhœa, 591
 heart, post-operative, 690
 stomach, acute, post-operative, 682
- Disorders of menstruation, 579
- Diverticulitis, etiology of, 520
 symptoms of, 520
 treatment of, 520
- Döderlein, bacillus of, 89
- Doran's theory of histogenesis of ovarian cysts, 384
- Dorsal position, 113
- Douche, vaginal, the, 706
- Douglas, pouch of, 46
 incision of, 652, 659
- Drainage, as protective pack, 657
 general considerations of, 657
 in appendicitis, 659
 in bladder, 456, 660
 indications for, 659
 in gall-bladder, 659
 technic of, 660
 in gall-duct, 659
 in kidney, 660
 in pancreas, 660
 in peritonitis, 659
 method of closing incision in drainage cases, 646
 position of patient to favor, 658
 post-operative care of, 660
 purpose of, 657
 technic of abdominal, 647
 through Douglas' cul-de-sac, 659
 vaginal, 659
 when placed in pelvis, 639
- Dressings, preparation of, for operation, 622
- Duct, gall, 660
 Gartner's, 9
 Müllerian, 1
 Skene's, 34
 Wolffian, 1
- Ductless glands, relation to genital organs, 63, 595
- Dudley's operation in pathologic antelexion of uterus, 243
- Dysmenorrhœa, 87, 587
 etiology of, 587
 acquired lesions in, 589
 antelexion of uterus in, 588
 congenital defects in, 587
 developmental defects in, 588
 gynatresia in, 589
 extragenital manifestations in, 587

Dysmenorrhœa, headache in, 587
in endometritis, 279
in pathologic antelexion of uterus, 240
in relation to disease, 94
in retroversion of uterus, 247
in symptomatology, 98
interval, 592
membranous, 592
etiology of, 592
treatment, 591
menstrual molimina in, 587
mental features in, 589
stenosis of cervix in, 588
treatment of, 589
atropin in, 590
benzyl benzoate in, 590
dilatation of cervix in, 591
electrical treatment in, 591
general considerations in, 590
nasal treatment in, 590
Norris drain in, 591
operations in, 591
abdominal, 591
on cervix, 591
on ovary, 591
on vaginal wall, 591
ovarian therapy in, 590
Dyspareunia, 172, 194, 601

E

Echinococcus cysts of kidney, 481
Ectopic pregnancy, 370 (*see also* *Extrauterine Pregnancy*)
Edebohl's suspension of kidney, 482
Electricity, uses of, in gynecology, 701
Electrocauterization in bladder tumors, 460
Electrocautery, 704
Elephantiasis of vulva, 173
Embolism, pulmonary, 688
Embryologic structures, 1
Embryology, 1
Embryonic rests and new formations originating in them, 8, 88, 327, 330, 384, 385, 388, 391, 395
Emmet, operation for lacerated cervix, 233
perineum, 210
Empyema of kidney pelvis, 471 (*see also* *Pyelonephritis*)
Endocervicitis, 223
symptoms of, 224
treatment of, 224
Endometrial cavity, curettement of, in gonorrhœal pelvic inflammatory disease, 417
Endometritis, acute, 277
diagnosis of, 278
etiology of, 277
gonococcus on, 277
pathology of, 278
symptoms of, 277
treatment of, 278
chronic, 278
diagnosis of, 279
etiology of, 278, 279
pathology of, 279

Endometritis, chronic, symptoms of, 279
treatment of, 279
curettement in, 280
local applications in, 280
cystic glandular, 279
fungous, 279
glandular, 279
polypoid, 279
Endometrium, 39
application to, 698
changes of, in myomata, 295
histology of, in inflammation of, 278
inflammation of, 277 (*see also* *Endometritis*)
menstrual changes in, 67
polyps of, 280
degenerations of, 280
diagnosis of, 281
pathology of, 280
symptoms of, 280
treatment of, 281
tuberculosis of, 564
Endosalpingitis, 359, 360
end results of, 361
Enemas, for post-operative care of bowels, 664
Enteroclysis, post-operative, 663
continuous, 668
interrupted, 668
solutions used in, 667
Enteroptosis, 507
midline ptosis, 508
partial, 508
treatment of, 512
Epispadias, 21, 27
Epoöphoron, 13
Equilibrium, antero-posterior, 536
centre of gravity in, 537
disturbances of, 538
joints concerned in, 537
lateral, 536
mechanics of, 536
muscles concerned in, 538
Esthiomene, vulva, 184
Ether anæsthesia, 649
Ethyl chloride, anæsthesia by, 650
local anæsthesia by, 652
Examination of abdomen, 112
general physical, in pelvic disease, 103
of anus, 162
of blood, in pelvic disease, 106
of patients, preparatory to operation, 614
general, 614
local, 614
of pelvis, 112, 125
instruments for, 119
local physical, 112
preparation for, 113
special methods of, 119
under anæsthesia, 112
of rectum, 162
of urine, bacteriologic, 110
in pelvic disease, 108
for tubercle bacillus, 111
Excretions, the, of the genitalia, 83

- Exercises for ptotic patients, 511, 512
 Exfoliative dysmenorrhœa, 592
 Exploratory celiotomy, 639
 laparotomy, 591, 639
 External genitalia, 25 (*see also Genitalia, External*)
 Extrauterine pregnancy, abdominal pregnancy in, 372-377
 diagnosis of, 377
 with lithopedion formation, 372
 diagnosis before rupture, 375
 at rupture or abortion, 376
 of abdominal pregnancy, 377
 of hæmatocele formation, 376
 etiology of, 369
 factors concerned in, 370
 fate of the ovum in, 372
 of the pregnant tube in, 374
 hæmatocele formation in, 373, 377
 hæmatoma in, 433
 etiology of, 433
 hemorrhage in, 373
 pelvic hæmatocele in, 373, 377
 intraperitoneal bleeding in, 373
 multiple pregnancy in, 370
 pathology of, 371
 nidation of the ectopic ovum, 371
 prognosis of, 377
 symptoms of, abortion, 374
 case of abdominal pregnancy, 375
 previous to tubal rupture, 374
 tubal rupture or abortion, 375
 treatment of, 378
 at time of rupture, 378
 early, 378
 of abdominal pregnancy, 379
 of old cases, 379
 time of operation in, 378
 vaginal puncture in, 379
 tubal abortion in, 371
 rupture in, 371
 fate of ovum in, 372
 uterine changes in, 374
 varieties of, 370
 abdominal, 370
 ampullar, 370
 interstitial, 370
 isthmic, 370
 ovarian, 370
 tubo-ovarian, 370
 Extraperitoneal operations in urinary fistula, 468
- F**
- Fallopian tubes, adenomyoma of, 326, 327
 anatomy of, 40
 at birth, 8
 carcinoma of, 368
 cysts of, 367
 developmental anomalies of, 15
 absence, 15
 accessory ostia, 15
 diverticula, 15
 foetal type, 15
 Fallopian tubes, developmental anomalies in, partial development of, 15
 supernumerary, 15
 diseases of, 359
 embryology of, 2
 embryomata of, 367
 enlargements of, 368
 accidents affecting, 368
 rupture of, 368
 torsion of, 369
 symptoms of, 369
 treatment of, 369
 excision of, 437
 inflammation of, 359 (*see also Salpingitis*)
 myomata of, 367
 new formations of, 367
 operations on, 436-438
 papillomata of, 367
 physiology of, 62
 polyps of, 367
 pregnancy in, 369 (*see also Extra-uterine Pregnancy*)
 resection of, 418
 syphilis of, 574
 tuberculosis of, 561
 Family history, in relation to pelvic disease, 95
 Faulty posture, types of, 539
 gorilla, 539, 541
 kangaroo, 539, 541
 overfeminine, 539
 slumped visceroptotic, 539
 Fecundation, 71
 Female pseudohermaphroditism, 22
 Fenwick type of bladder ulcer, 459
 Fibroid tumors of uterus, 295 (*see also Myomata of Uterus*)
 Fibromata of ovary, 396
 Fibromyoma of vulva, 185
 Fibrosis uteri, 283
 Fissure in ano, 522
 diagnosis of, 522
 symptoms of, 522
 treatment of, 523
 divulsion of sphincter, 523
 operation for, 523
 of urethra, 445
 Fistula in ano, 524
 diagnosis of, 525
 symptoms of, 525
 treatment of, 525
 operations for, 525
 urinary, 463 (*see also Urinary Fistula*)
 vesico-umbilical, 21
 Fluid, menstrual, 66
 Flushing at menopause, 594
 infections in etiology of, oöphoritis, 381
 post-operative parotitis, 691
 urethritis, 444
 toxic arthritis, 550
 Foetal structures, 1
 Follicles, Graafian, 9, 69
 maturation of, 9, 69
 Form for history, 92

Fornices, vaginal, 34
 anterior, 35
 posterior, 35
 Fossa navicularis, 32
 Fourchette, 33
 Fowler, bed, 668
 position, 669
 Frankl's theory, of cystic degeneration of
 ovary, 402
 of histogenesis of ovarian cysts, 384
 Frazier's operation for ptosis of colon, 516
 Fulguration in bladder tumors, 460
 Fundus of uterus, 37
 carcinoma of, 342

G

Gall-bladder, drainage of, 659
 post-operative care of, 661
 Galvanism in treatment of dysmenorrhœa,
 591
 Gärtner's duct, 9, 13
 Gastric dilatation, acute post-operative, 682
 Gastro-intestinal symptoms in pelvic disease,
 100
 Gastropexy, 515
 Gauze drains, 647
 pads, in isolation of operative area, 637
 use of, in abdominal surgery, 648
 Gelhorn's method of using heat in treatment
 of pelvic disease, 701
 General health in pelvic disease, 101
 Generative organs, anatomy of, 31
 anomalies of, 15
 changes of, in pregnancy, 75, 78
 developmental anomalies of, 15
 embryology of, 1
 excretions, the, of the, 83
 physiology of, 61
 relation of, to glands of internal
 secretion, 63-65
 syphilis of, 569
 tuberculosis of, 560 (*see also Tubercu-
 losis of Generative Organs*)
 Genital fistula, 463
 Genitalia, external, abnormalities of, 25
 treatment of, 27
 anatomy of, 31
 cutaneous diseases of, 166
 developmental anomalies of, 20
 diseases of, 166
 embryology of, 2
 hernia in, 189
 herpes of, 166
 injuries of, 188
 malformations of, 20
 diagnosis of, 25
 treatment of, 27
 parasitic diseases of, 166
 pediculosis of, 166
 physiology of, 62
 ringworm of, 166
 venereal conditions of, 173
 Genito-urinary system, 440, 453, 469
 Gestation (*see Pregnancy*)

Gland of Bartholin, 33 (*see also Bartholin's
 Glands*)
 mammary, 65
 of internal secretion, 63-65
 parathyroid, 64
 pineal, 65
 pituitary, 63
 sexual, 1, 42
 suprarenal, 64
 thyroid, 64
 Glands of internal secretion in premature
 menopause, 595
 Glans clitoris, 33
 Gloves, preparation of, for operation, 622
 Glycosuria, in pruritis, 170
 Goitre in women, 64
 Gonococcus, characteristics of, 554
 diagnosis of, 123
 examination of smears for, 556
 immunity to, 554
 in endometritis, 277, 278
 infection from, in chronic cases, 554
 in pelvic inflammatory disease, 411
 latency of, 555
 lesions due to, 554
 mode of invasion, 89
 smear preparation in, 124
 staining of, 124
 technic of preparation of smears for, 556
 glass slides in, 556
 time of obtaining, 557
 Gonorrhœa, cause of endometritis, 277
 complement-fixation test for, 107
 diagnosis of, 556
 gonococcus in, 556
 smears in, 556
 symptomatology in, 555
 douches in, 556
 general peculiarities, 554
 latent, 556
 pelvic inflammation due to, 554
 prognosis of, 558
 in acute cases, 558
 in chronic cases, 558
 prophylaxis of, 558
 education in, 559
 residual, 555
 sterility due to, 554
 symptoms of, 555
 localization of lesions, 556
 macules in, 556
 mildness of, 555
 seat of initial attack, 555
 smears in, 556
 treatment, 559
 Gonorrhœal arthritis, 725
 macules, 556
 pelvic inflammatory disease, conservation
 of adnexa in, 418
 diagnosis of, 414
 differential diagnosis of, 414
 from appendicitis, 414
 puerperal inflammatory
 disease, 415
 etiology of, 412

- Gonorrhœal pelvic inflammatory disease, hysterectomy in, 417
 technic of, 417
 pathology of, 412
 results of, 414
 symptoms of, 414
 treatment of, 415
 acute, 415
 cauterization in, 417
 chronic stage, 416
 curettement in, 417
 hysterectomy in, 417
 technic of, 417
 palliative measures in, 415
 resection of ovary in, 418
 sera in, 725
 subacute stage, 416
 time of operation in, 415
 vaccines in, 726
 vaginal douches in, 415
 puncture in, 416
- Gorilla type of faulty posture, 539, 541
 treatment of, gymnastic, 546
 mechanical, 546
 supportive, 546
- Graafian follicle, cysts of, 402
 development of, 9, 69
- Grafts, ovarian, 606
- Graves' disease in relation to generative organs, 64
- Gumma of vulva, 571
- Gynatresia, 23, 89
 diagnosis of, 25-27
 in dysmenorrhœa, 588
 symptoms of, 23
 treatment of, 27
- Gynecologic postures, 113
- H**
- Habit, the menstrual, 579
- Habits of life, in relation to disease, 93
- Hæmatocele in extrauterine pregnancy, 373
- Hæmatocolpos, 24
- Hæmatogenous infections in oöphoritis, 381
 in pyelonephritis, 471
- Hæmatoma of pelvis, diagnosis of, 433
 etiology of, 433
 prognosis, 433
 symptoms of, 433
 treatment of, 433
 of vulva, 180
- Hæmatometra, degenerations of, 288
 etiology of, 288
 symptoms of, 288
 treatment of, 288
- Hæmatosalpinx, 24, 367
- Hæmatotrachelos, 24
- Hæmaturia in tuberculosis of kidney, 475
- Hæmostasis, 640
- Hands, preparation of, for operation, 622
- Headache, as symptom of pelvic disease, 99
 in dysmenorrhœa, 587
- Heart, disease of, in operative cases, 615 (*see also Cardiac Risks*)
 dilatation of, post-operative, 690
 in myomata, 303, 306
 in pelvic disease, 105
- Heat, in treatment of pelvic inflammatory disease, 700
- Hegar's sign of pregnancy, 76-79
 operation for lacerated perineum, 211
- Hemorrhage, arterial, 671
 after abdominal operations, 671
 diagnosis, 672, 673
 symptoms, 672
 treatment of, 673
 after plastic operations, 672
 capillary oozing, 671
 in ectopic pregnancy, 373
 intraperitoneal, 373
 menstrual, mechanics of, 66
 post-operative, varieties of, 671
 venous, 671
- Hemorrhagic uteri, radium in, 720
- Hemorrhoids, diagnosis of, 528
 pathology of, 527
 symptoms of, 527
 treatment of, 528
 operations in, 529
- Heredity in etiology of carcinoma of uterus, 330
- Hermaphroditism, 22
- Hernia, of ovary, 409
 of rectum, 531
 of uterus, 238
 perineal, 189
 pudendal, 189
- Herpes, of genitalia, 166
- History taking, 91
 form of record, 92
 family, in relation to pelvic disease, 95
 general previous, to pelvic disease, 96
 menstrual, in relation to disease, 94
- Hodge pessary, 701
- Hot flashes at menopause, 594
- Hühner's method in diagnosis of sterility, 601
- Hunner type of bladder ulcer, 459
 pathology of, 459
 treatment of, 460
- Hydatid, stalked, of Morgagni, 10, 367
- Hydatidiform mole, in etiology of chorio-epithelioma, 347
 -like structure in cyst of ovary, 399
 recognition of, 290
- Hydrocele of canal of Nuck, 187
- Hydronephrosis, 470
 diagnosis, 471
 etiology, 470
 pathology, 470
 treatment, 471
- Hydrops folliculi, 402
 tubæ profluens, 367, 593
 in dysmenorrhœa, interval type, 592
- Hydrosalpinx, 360, 365
 etiology of, 365
 follicularis, 366

Hydrosalpinx, rupture of, 368
 simplex, 366
 torsion of, 369
 Hygiene of adolescence, 609
 Hymen, developmental anomalies of, 20
 atresia, 20
 double, 20
 diseases of, 192
 abnormal elasticity of, 192
 cystic tumors of, 192
 rigidity of, 192
 Hyperinvolution of uterus, 286
 etiology of, 286
 symptoms of, 287
 treatment of, 287
 Hypernephromata, origin of, 13
 relation to pelvic disease, 64
 Hypertension in operative cases, 616
 Hypertrophy of cervix, 229
 Hypospadias, 21, 27
 Hyposuprarenalism, relation to pelvic disease, 64
 Hypotension in operative cases, 616, 617
 Hysterectomy, abdominal, 317
 bisection of uterus in, 436
 for carcinoma of uterus, 340, 345
 for myomata, 317
 for pelvic inflammatory disease, 433
 vaginal, 340, 345, 351
 for carcinoma of uterus, 340, 345
 for myomata of uterus, 351
 with paravaginal incisions, 352, 353
 variations in technic of, 434
 Hysterocele, 238, 263
 Hysteromyomectomy, 317
 Hysteropexy, 257, 260
 Hysterotomy, local anæsthesia in, 651

I

Ileus, adynamic, 678, 682
 dynamic, 678, 682
 mechanical, 678, 682
 paralytic, 678, 682
 Illumination for pelvic examination, 118
 with head mirror, 118
 Incisions for abdominal operations, 624
 technic of, 635
 directions regarding, 633
 dressing, 646
 for kidney operations, 630
 post-operative care of, 669
 suppuration of, post-operative, 689
 treatment of, 689
 technic of closing, 644
 in drainage cases, 646
 Incontinence of urine, 447, 448
 Indigo-carmin in kidney function tests, 158
 Infectious diseases, relation of, to pelvic diseases, 93
 Insanity, as a post-operative complication, 612
 at menopause, 595
 etiology of, 612
 in relation to gynecology, 611

Insanity, types of, benefited by operation, 612
 not benefited by operation, 611
 Insemination, 71
 artificial, 606
 Instruments for pelvic examination, 119
 Intermenstrual pain, periodic, 592
 Internal secretion, glands of, in premature menopause, 595
 in relation to generative organs, 63-65
 Interposition operation for cystocele, 220
 of Watkins, 220
 for prolapse of uterus, 272
 of Watkins, 272
 Interval dysmenorrhœa, 592
 Intestinal obstruction, acute, 505, 678
 causes of, 678
 diagnosis of, 680
 etiology of, 678
 pathology of, 678
 forms of, 678
 post-operative, 678
 symptoms of, 679
 treatment of, 681
 operative, 681
 stasis, acute, 505
 chronic, from pelvic disease, 507
 diagnosis of, 511
 from adhesions between intestines and peritoneum, 510
 intestinal loops, 510
 the mesenteries, 510
 the mesentery and omentum, 510
 from enteroptosis, 507
 from kinking of colon, 509
 from redundancy of colon, 509
 from overdistention of colon, 509
 symptoms of, 511
 treatment, 512
 dietetic, 512
 medical, 513
 postural, 512
 surgical, 515
 Beyea's operation, 515
 Coffey's operation, 516
 colopecty, 515
 contraction of the abdominal parietes, 520
 division of adhesions, 516
 gastropexy, 515
 intestinal anastomosis, 518
 resection of the intestine, 519
 Wilms' operation, 516
 Intrauterine tampon, 705
 Involution of uterus, 285
 Israel's kidney incision, 632

K

Kangaroo type of faulty posture, 539, 541
 treatment of, gymnastic, 546
 mechanical, 546
 supportive, 546

- Kelly's kidney incision, 630
 Kidney, absence of, 21
 rudimentary, 21
 abscess, 471 (*see also Pylonephritis*)
 drainage in, 660
 post-operative care of, 661
 adenocystoma of, 481
 adrenal tumors in, 481
 aspiration of, 485
 Brödel's white line in, 484
 calculus, 478 (*see also Renal Calculus*)
 cystic tumors of, 480
 diseases of, 469
 echinococcus cysts of, 481
 Edebohl's suspension of, 482
 embryology of, 3
 empyema of pelvis of, 471
 examination of, with wax-tipped bougie, 150
 fœtal type, 21
 functional activity of, estimation of, 158, 619
 blood urea test of, 160
 by chromocystoscopy, 158
 by chromoureteroscopy, 159
 combined, 158
 by indigo-carmin, 158
 by phenolsulphonephthalein, 159
 separate, 158
 horseshoe, 21
 hydronephrosis of, 470
 incisions for exposure of, 481
 directions regarding, 633
 Israel's 632
 Kelly's, 630
 Mayo-Robson's, 632
 Mayo's, 631
 infection of, post-operative, 689
 inflammation of, post-operative, 684
 lithotomy, 483
 malformations of, 21
 movable, 469
 nephropexy, 483
 nephrotomy, 483
 nephrectomy, 484
 operation technic in treatment of, 481
 palpation of, 138
 pararenal tumors with, 481
 pelvis, lavage of, 488
 percussion of, 140
 punch, Murphy's, 140
 trimanual method of, 139
 polycystic disease of, 480
 ptosis of, 509
 pyelitis, 485
 pyelonephritis, 471
 pyelonephrosis, 471
 pyelotomy, 483
 risks in operative cases, 618 (*see also Urinalysis*)
 Röntgenographic examination of, 151
 percentage of error in, 153
 source of error in, 153, 155
 stone, 478 (*see also Renal Calculus*)
 diagnosis of, 150
 Kidney, suspension of, 482, 483
 tuberculosis of, 473
 tumors of, 480
 white line in, 484
 Knee-chest position, 114, 115
 Kobelt's tubules, 11
 Kraurosis of vulva, 172
 Kruckenberg tumor of ovary, 397
- ### L
- Labia, majora, anatomy of, 32
 minora, anatomy of, 33
 hypertrophy of, 20
 Labor, 79
 in relation to pelvic disease, 95
 Lacerations of cervix, 226
 perineum, 201
 Lane's kink, 510
 Langhan's layer, 73
 Lavage of kidney pelvis, 488
 Leucocytosis in pelvic disease, 106
 in peritonitis, 677
 Leucorrhœa, as symptom of carcinoma, 344
 of endometritis, 279
 of metritis, 283
 of pelvic disease, 99
 of retroversion of uterus, 246
 bacteriology of, 198
 definition of, 197
 etiology of, 197
 lactic acid bacillus, treatment of, 198
 treatment of, 198
 vaccines in, 199
 Levator ani muscle, 50
 function of, 200
 laceration of, 201
 Ligaments of uterus, 46
 of ovary, 42
 of pelvis, 46
 triangular, 53
 Lochia, 81
 Lubricant, 117
 Lungs, in pelvic disease, 106
 disease of, post-operative, 684
 Lupus, of vulva, 182
 Lutein cystoma ovarii, 404
 Lymphatics of external genitalia, 60
 of pelvis, 58
 of uterus, 60
 of vagina, 60
 Lymph-nodes, pelvic, 58
 hypogastric, 59
 iliac, 58
 inguinal, 59
 internal iliac, 59
 sacral, 59
- ### M
- Maculæ gonorrhœica, 556
 Male pseudohermaphroditism, 23
 Mammary gland, relationship of, to generative organs, 65
 Martin's operation for cystocele, 216
 Mayo's kidney incision, 631
 Mayo-Robson's kidney incision, 632

McBurney's incision, 627
 Meatus, urinary, 43
 Mechanics of normal support of perineum, 200
 Meckel's diverticulum, inflammation of, 520
 Menge pessary in descensus of uterus, 270, 703
 Menstrual cycle, 65-70
 fluid, 66
 source of, 40
 habit, 66, 579
 variations of, in pelvic disease, 94
 history in pelvic disease, 94
 molimina, 580
 symptoms in pelvic disease, 98
 Menstruation, absence of, 580
 anatomic changes incident to, 66
 cessation of, 580
 delayed, 580
 disorders of, 579
 false, 23
 mechanics of, 66
 pain in intervals between, 592
 painful, 587
 phenomena of, 65
 precocious, 579
 relationship of, to ovulation, 66-69
 retarded, 580
 vicarious, 580
 with expulsion of membrane, 592
 Mental features in dysmenorrhœa, 589
 Menopause, 82, 94
 age of, 82
 artificial, etiology of, 83, 595
 ovariectomy in, 595
 symptoms of, 596
 vasomotor, 596
 neurotic, 596
 treatment of, 596
 ovarian therapy in, 596
 blood-pressure changes at, 594
 changes in ovaries in, 82
 menorrhagia at, 594
 mental changes in, 594
 metrorrhagia at, 594
 nervous manifestations in, 83
 premature, 83, 594
 etiology of, 594
 gland of internal secretion in, 595
 treatment, 595
 relation to carcinoma, 594
 symptoms of, 594
 time of, 593
 Menorrhagia, as symptom of endometritis, 279
 of pelvic disease, 99
 of retroversion of uterus, 246
 etiology of, 583
 in metritis, 283
 in myomata, 303
 treatment of, 584
 Metritis, acute, 282
 symptoms of, 282
 treatment of, 282

Metritis, chronic, 282
 diagnosis of, 284
 etiology of, 282
 syphilis in, 282
 pathology of, 283
 symptoms of, 283
 treatment of, 284
 Metrorrhagia, as symptom of endometritis, 279
 of pelvic disease, 99
 of retroversion of uterus, 246
 etiology of, 585
 in metritis, 283
 in myomata, 303
 treatment of, 586
 Micturition (*see Urination*)
 Miscarriage, 79
 Mittelschmerz, 592
 Mole, hydatidiform, with ovarian cysts, 404
 in etiology of chorioepithelioma, 347
 Molimina menstrualis, 580, 587
 Morgagni, stalked hydatid of, 10
 Morphine as preanæsthetic agent, 650, 653
 Movable kidney, 469
 Müllerian duct, 1
 failure of fusion of, 16-19
 in etiology of adenomyoma, 327
 Multiple operations, 655
 Murphy button, 682
 kidney punch, 140
 Myomata of uterus, blood supply of, 293
 carcinoma of uterus with, 300
 changes in uterus in, 295
 of endometrium, 295
 of muscular wall, 295
 choice of operation in, 311
 circulatory lesions in, 302
 anæmia, 303
 cardiac degeneration, 303
 dilatation, 303
 murmurs, 303
 palpitation, 303
 thrombosis, 303
 complications of, 296
 degenerations of, 297
 abscess, 297
 angiomatous, 299
 calcareous infiltration, 297
 carcinomatous, 299
 cystic, 297
 hyaline, 297
 lipomyomatous, 299
 necrosis, 299
 sarcomatous, 299, 339, 346
 suppurative, 297
 diagnosis of, 306
 by abdominal examination, 307
 by bimanual palpation, 307
 interstitial, 307
 submucous, 307
 subperitoneal, 307
 differential diagnosis from cystic tumors of ovary, 308
 pelvic inflammatory masses, 309

Myomata of uterus, differential diagnosis
 from pregnancy, 309
 solid tumors of ovary, 308
 enucleation, 311
 etiology of, 292, 303
 congenital anomalies in, 292
 racial element in, 292
 reproduction in, 292
 syphilis in, 292
 growth of, 295
 histology of, 292
 hysteromyomectomy in, 311, 317
 conservation of adnexa in, 312
 indication for operation in, 310
 myomectomy in, 311, 312, 314
 objections to, 311
 vaginal, 311
 operative technic of, 313
 abdominal myomectomy, 314
 for multiple myomata, 315
 hysteromyomectomy, 317
 with conservation of adnexa,
 322
 modifications of, 319-321
 treatment of cervical canal
 in, 324
 stump after, 323
 panhysterectomy, 324
 treatment of ureters in, 324
 vaginal myomectomy, 316
 origin of, 292
 panhysterectomy in, 313, 324
 with carcinoma of cervix, 313
 pressure effects of, 300
 on bladder, 300
 on nerves, 302
 on pelvic vessels, 302
 on rectum, 302
 on ureters, 301
 situation of, 294
 cervical, 294
 interstitial, 294
 intraligamentous, 294
 submucous, 294
 subperitoneal, 294
 subvesical, 294
 symptoms of, 304
 anæmia in, 303
 circulatory symptoms in, 306
 leucorrhœa, 305
 menorrhagia, 304
 metrorrhagia, 304
 causes of, 304
 pain, 305
 at menstruation, 305, 306
 from adhesions, 305
 from pressure, 305
 on defecation, 305
 on urination, 305
 referred to distant parts, 306
 severest, 305
 treatment of anæmia in, 310
 curettement in, 310
 for hemorrhage, 310
 operative, 311

Myomata of uterus, treatment of, palliative,
 310
 radium in, 310, 718
 Röntgen ray in, 310, 718
 Myomectomy, abdominal, 314
 vaginal, 316
 Myometrium, 40

N

Nabothian cysts, 228, 230
 Nasal treatment in dysmenorrhœa, 590
 Nausea and vomiting, post-operative, exces-
 sive, 674
 treatment of, 674
 Nephrectomy, 484
 incisions for, 630
 in urinary fistulæ, 468
 Nephritis, in operative cases, 618
 post-operative, etiology of, 684
 treatment of, 684
 Nephrolithotomy, 483
 Nephropexy, 483
 Nephroptosis, 509
 Nephrotomy, 483
 Nervous manifestations in pelvic disease, 101
 Neuroses, relation of, to pelvic diseases, 610
 prognosis in, 611
 treatment of, 611
 with acquired lesions of pelvis, 610
 without acquired lesions of pelvis, 610
 varieties of, 610
 New formations originating in embryonic
 rests, 9
 Nidation of ovum, 72
 Nitrous oxide, and oxygen anæsthesia, 650
 oxygen and ether anæsthesia, 650
 Normal support of perineum, mechanics of,
 200
 type of posture, 540
 Norris drain, in pathologic antelexion of
 uterus, 243
 in treatment of dysmenorrhœa, 591
 Nose, applications to, in dysmenorrhœa, 590
 Nubility, 61
 Nuck, canal of, 48, 187
 Nurses, preparation of, for operations, 622
 Nymphæ (*see Labia Minora*)

O

Obesity, 550
 Obstruction of intestine, 505
 post-operative, 680
 Occupation in relation to pelvic disease, 93
 Oligomenorrhœa, 580 (*see also Amenorrhœa*)
 Omentum, in treatment of denuded surfaces,
 643
 Oöphorectomy, 400, 435
 Oöphoritis, acute interstitial, diagnosis of, 382
 chronic, 382
 end-results of, 382
 etiology of, 381
 pathology of, 381
 symptoms of, 382
 treatment of, 382

- Operating room, lighting of, 623
 - ventilation of, 623
- Operations during pregnancy, 656
- Operative area, exposure of, 637
 - gauze pack in, 637
 - isolation of, 636
 - preparation of, 620
- technic, in abdominal incisions, 624
 - closing the incision, 644
 - drainage in, 639, 647, 657
 - during pregnancy, 656
 - gauze pack in, 637
 - hemostasis in, 640
 - in dressing the incision, 646
 - with drainage, 647
 - in kidney operations, 630
 - in multiple operations, 656
 - in treatment of adhesions, 641
 - of denuded surfaces, 643
 - of incisions, 635
 - of wounds of viscera, 642
- Operator, preparation of, for operation, 621
- Ovarian abscess, 381
 - therapy in amenorrhœa, 581
 - in artificial menopause, 596
 - in dysmenorrhœa, 590
- transplantation in sterility, 606
 - heterografts in, 606
 - homografts in, 606
- Ovariectomy, 400, 435
- Ovaritis, 381
- Ovary, abscess of, 381
 - absence of, 15
 - adenocystomata of, 384
 - etiology of, 384
 - pathology of, 384
 - anatomy of, 42
 - at birth, 6
 - atrophy of, 408
 - causes of, 409
 - carcinoma of, diagnosis of, 395
 - etiology of, 395
 - metastatic, 408
 - pathology of, 395
 - symptoms of, 395
 - changes in, at menopause, 82
 - during menstruation, 69
 - combined epithelial and connective-tissue tumors of, 397
 - compound theca-lutein tumors of, 404
 - connective tissue, new growths of, 396
 - benign, 396
 - fibromata, 396
 - degenerations of, 396
 - pathology of, 396
 - malignant, 396
 - sarcomata, 396
 - Krukenberg tumor, 397
 - pathology of, 396
 - cystic degeneration of, 402
 - cysts of, 383
 - classification of, 383
 - theories regarding histogenesis of, 384
- Ovary, cysts of, with hydatid mole, 404
 - daughter cysts of, 387
 - dermoid cysts of, 383, 397
 - origin of, 12, 397
 - pathology of, 399
 - thyroid tissue in, 399
 - developmental anomalies of, 15
 - effect of radium on, 719
 - removal of, 595
 - embryology of, 1
 - epithelial new growths of, 384
 - glandular cysts of, 384
 - adenocystoma, 384
 - diagnosis of, 389
 - differential diagnosis of, from
 - ascites, 391
 - from fat, 391
 - from myomata, 389
 - from pregnancy, 389
 - from tympanites, 391
 - etiology of, 384
 - theories of, 384
 - papillomatous, 388
 - pathology of, 384
 - pseudomucinous, 388
 - serous, 388
 - symptoms of, 388
- grafts of, 606
- hernia of, 409
- hyperplasia of, 383
- hypertrophy of, 383, 409
- inflammation of, 381 (*see also Perioophoritis*)
- inflammatory diseases of, 382
 - diagnosis of, 382
 - symptoms of, 382
 - treatment of, 382
- internal secretions of, 62, 63
- Krukenberg tumor of, 397
- lymphatics of, 60
- malformations of, 15
- menopause and, 595
- mixed tumor of, 397
- mother cysts of, 387
- new growths of, treatment of, 399
 - carcinoma, 401
 - cystomata, 399
 - during pregnancy, 401
 - fibromata, 402
 - intraligamentous cysts, 400
 - papillomatous cysts, 401
 - sarcomata, 402
- operations on, 404, 418, 435
- papillomatous cysts of, 393
 - malignant degenerations of, 393
 - pathology of, 394
 - symptoms of, 394
- physiology of, 62
- prolapse of, diagnosis of, 409
 - etiology of, 409
 - symptoms of, 409
 - treatment of, 409
- relation of, to glands of internal secretion, 62, 63
- retention cysts of, 402

- Ovary, retention cysts of, corpus luteum
 cysts, 403
 cystic degeneration, 402
 diagnosis of, 403
 Graafian follicle cysts, 402
 hydrops folliculi, 402
 simple, 402
 symptoms of, 403
 treatment of, 403
 resection of ovary in, 404
 rudimentary, 15
 supernumerary, 15, 63
 syphilis of, 574
 teratomata of, 383
 thyroid tissue in, 399
 transplantation of, 606
 tuberculosis of, 565
 tumors of, accidents to, 405
 classification of, 383
 complicating pregnancy, 401
 complications of, 405
 connective-tissue type of, 383
 epithelial type of, 383
 infection of, 405
 malignant degeneration of, 407
 rupture of, 407
 causes of, 407
 results of, 407
 torsion of, 406
 cause of, 406
 treatment of, 406
 Ovula, Nabothi, 228, 230
 Ovulation, anatomic changes incident to, 70
 relationship of, to menstruation, 66, 69
 Ovum, nidation of, 72

P

- Pain in symptomatology of pelvic disease, 97
 Pampiniform plexus, 56
 Panhysterectomy, 313, 324
 for carcinoma of uterus, 324
 for myomata of uterus, 313
 treatment of ureters in, 324
 Wertheim's technic in, 349
 Paracolicum, 49
 Paracystium, 49
 inflammation of, 430
 Parametritis, 282, 419, 430
 Parametrium, 49
 Paraoöphoron, 9
 Paraproctium, 49
 inflammation of, 430
 Pararenal tumors, 481
 Parasitic diseases of the external genitalia, 106
 Parathyroid glands, relations of, to generative organs, 64
 Paravaginitis, 193
 Parotitis, post-operative, 691
 Parovarian cysts, 391
 diagnosis of, 393
 differential diagnosis of, from myomata, 393
 etiology of, 11, 391

- Parovarian cysts, growth of, 392
 symptoms of, 392
 Parovarium, 9
 papillomatous cysts of, 393
 malignant degenerations in, 393
 Parturition (*see Labor*)
 Pathologic antelexion of uterus, 237
 Paul's tube, 683
 Pediculosis pubis, 166
 Pelvic abscess, 428, 431
 adhesions, treatment of, 641
 arteries, 54
 bacteriology, 88, 411
 cellular tissue, 48
 syphilis of, 575
 cellulitis, 430 (*see also Cellulitis, Pelvic*)
 connective tissue, 48
 diseases, onset of, 96
 relation of neuroses to, 610
 examination, by inspection, 125
 by palpation, 125
 bimanual, 126
 with cervix pulled down, 129
 with finger in rectum, 129
 simple digital, 126
 trimanual, 130, 131
 local physical, 112
 under anaesthesia, 112
 floor, fascia of, 53
 injuries to, 200
 muscles of, 50
 physiology of support of, 200
 triangular ligament of, 53
 inflammatory disease, acute, 411
 chronic, 428 (*see also Chronic Pelvic Inflammatory Disease*)
 classification of, 411
 etiology of, 411
 factors in etiology of, 412
 gonorrhœal, 412 (*see also Gonorrhœal Pelvic Inflammatory Disease*)
 in etiology of dysmenorrhœa, 589
 instrumental, 425 (*see also Post-operative Pelvic Inflammatory Disease*)
 pathology of, 411
 post-operative, 425 (*see also Post-operative Pelvic Inflammatory Disease*)
 puerperal, 419 (*see also Puerperal Pelvic Inflammatory Disease*)
 treatment of, operative technic in, 433
 hysterectomy, 433
 salpingectomy, 437
 salpingo-oöphorectomy, 436
 salpingostomy, 438
 vaginal incision and drainage, 438
 use of heat in, 700
 Gelhorn's method of, 700

- Pelvic ligaments, 46
 lymphatics of, 58
 massage in chronic pelvic cellulitis, 433
 peritoneum, 45
 veins, 56
- Pendulous abdomen, 550
- Percussion, trimanual method of, 134, 393
- Percy's method in carcinoma of cervix, 354, 355
- Perforation of uterus, accidents in, 287
 etiology of, 287
 injury to intestine in, 287
 symptoms of, 287
 treatment of, 287
- Perimetritis, 430
- Perineal operations, preparations for, 620
- Perineorrhaphy, 209, 210, 213
- Periodic intermenstrual pain, 592
- Perioöphoritis, diagnosis of, 382
 end-results of, 382
 etiology of, 381
 pathology of, 381
 symptoms of, 381
 treatment of, 381
- Perineum, injuries to, 200
 forms of, 200
 immediate, 200
 remote, 200
 mode of production of, 201
 results of, 200
 lacerations of, 201
 complete, 202
 symptoms of, 207
 lateral, 201
 effects of, 201
 median, 201
 operations for, complete tear of, 214
 Emmet, 209, 210
 Hegar, 211
 relaxation of, diagnosis of, 205
 treatment of, 204, 208
- Perisalpingitis, 360, 361
 end-results of, 365
- Peritoneum, of pelvis, 45
 abdominal, tuberculosis of, 563
- Peritonitis, post-operative, 675
 diagnosis, 677
 localization of, 676
 symptoms, 676
 treatment of, 678
- Pessaries, use of, 702
 care of, 704
 disk, 702
 fitting of, 250
 Hodge, 701
 indications for, 250, 251, 269, 270, 702
 Menge, 703
 Smith, 701
 soft rubber, 702
 types of, 702, 703
- Pfannenstiel's theory of histogenesis of ovarian cysts, 384
- Pflüger's tubules, 384
- Phenolphthalein, estimation of elimination of, 160
- Phenolphthalein in kidney function test, 159
- Phlebitis, etiology of, 686
 placental, 420
 post-operative, 686
 treatment of, 687
- Physical examination, in pelvic disease, 103
- Physiology of generative organs, 61
- Physometra, etiology of, 288
 symptoms of, 288
 treatment of, 288
- Pick's theory of histogenesis of ovarian cysts, 384
- Pineal gland, relationship of, to generative organs, 65
- Pituitary body, extract of, in shock, 670
 relationship of, to generative organs, 63
- Placenta, formation of, 73
 relationship of, to generative organs, 65
- Placental thrombophlebitis, 420
- Placentation, 73, 75
- Plastic operations (*see Colporrhaphy, Perineorrhaphy and Trachelorrhaphy*)
 hemorrhage after, 673
- Pleurisy, post-operative, 684
- Polycystic disease of kidney, 480
- Polyps of rectum, 532
- Position, dorsal, 113
 erect, 116
 for examinations, 113
 knee-chest, 114, 115
 recumbent, 116
 Sims', 115
 supine, 116, 117
- Posture, after operations, 668
 errors in, 539
 Fowler, 669
 in cardiac cases, 615
 normal type of, 540
 Trendelenburg, 669
- Post-operative care of drainage cases, 661
 complications, acidosis, 692
 acute gastric dilatation, 682
 bronchitis, 683
 cardiac dilatation, 690
 cystitis, 690
 hemorrhage, 671
 intestinal obstruction, 678
 nausea and vomiting, 674
 nephritis, 684
 parotitis, 691
 peritonitis, 675
 phlebitis, 686
 pleurisy, 684
 pulmonary, embolism, 688
 renal infection, 689
 shock, 670
 suppression of urine, from ureteral obstruction, 685
 suppuration in incision, 689
 in pelvis, 690
 tympanites, 674
- pelvic inflammatory disease, 425
 etiology of, 425
 pathology of, 425

- Post-operative pelvic inflammatory disease,
 symptoms of, 426
 treatment of, 427
 operative measures in, 427
 palliative measures in, 428
 vaginal puncture in, 428
 treatment, of bladder, 665
 diet in, 664
 dressing incision, 669
 enterocolysis in, 667
 nausea, 663
 of bowels, 664
 pain, 663
 posture, 668
 thirst, 663
 vomiting, 663
- Pouch of Douglas, 46
- Pozzi's operation in pathologic ante flexion of
 uterus, 243
- Precancerous changes in uterus, 343
- Precocious menstruation, 579
- Pregnancy, complicated by appendicitis, 656,
 657
 by ovarian cysts, treatment of, 401
 corpus luteum of, 76
 diagnosis of, from myomata, 309
 from ovarian cysts, 389
 Hegar's sign of, 76
 in relation to pelvic disease, 94
 in retroverted uterus, 656
 treatment of, 253, 254, 656
 operations during, 401, 656
 pyelitis in, 486, 487
- Premature menopause, 594
- Preparation of, for operation, assistants,
 catgut, 622, 623
 dressings, 622
 furniture, 623
 gloves, 622
 hands, 622
 for pelvic examination, 117
 instruments, 623
 nurses, 622
 operating room, 623
 operative area, 620
 patients, 613, 621
- Preparatory measures in hysterectomy, 345
 in operative cases, 614
- Procidentia uteri, 238, 263
- Proctoscopes, Kelly, 164
 Tuttle, 163
- Proctoscopic examination of rectum, 163
- Prolapse of ovary, 409
 of rectum, 532
 of the urethral mucosa, 446, 447
 of uterus, 238, 263
- Pruritis ani, 527
 vulva, 169-171
 radium in, 721
- Pseudoamenorrhoea, 580
- Pseudohermaphroditism, female, 22
 male, 23
- Pseudomucin, 388
- Pseudomyxomata ovarii, 407
 peritonei, 407
- Pto sis of intestines, 507
 of kidney, 469
- Puberty, age of, 61
 influences affecting, 61
 manifestations of, 61
 ovarian development at, 62
- Puerperal pelvic inflammatory disease, 419
 diagnosis of, 421
 examination in, 421
 of pelvic lesions in, 421
 end results of, 422
 etiology of, 419
 gonococcus in, 419
 streptococcus in, 419
 mode of invasion
 of, 419
 pathology of, 420
 pelvic abscess in, 422
 lesions resulting
 from, 420
 prognosis, 421
 factors influencing, 421
 symptoms of, 420
 treatment of, 422
 arseno-benzol in, 424
 exploration of uterus in,
 423
 horse serum in, 424
 palliative measures in,
 422
 sera in, 424
 tamponade of uterus
 in, 423
 vaccines in, 424
 vaginal puncture in, 425
- Puerperium, pyelitis in, 485
- Pulmonary diseases, post-operative, 683
 in etiology of pelvic disease, 106
 embolism, 688
- Pulse in pelvic disease, 104
- Pyelitis, bacteriology of, 486
 etiology of, 485
 in pregnancy, 486
 pathology of, 485
 prognosis of, 486
 symptoms of, 486
 treatment of, 487
 vaccines in, 488
- Pyelography, death following, 157
 in diagnosis of movable kidney, 469
 in hydronephrosis, 471
 in kidney disease, 157
 in ureteral calculus, 157
 obstruction, 157
 solutions for, 156, 158
 preparation of, 156
 technic of, 156
- Pyelonephritis, 471
 etiology of, 471
 hæmatogenous infection in, 471
 urinary passages, infection of, in,
 471
 pathology of, 471

- Pyelonephritis, symptoms, 472
 - treatment of, 473
 - operations in, 473
- Pyelonephrosis, 471
- Pyelotomy, 483
- Pyometra, etiology of, 288, 335
 - symptoms of, 288
 - treatment of, 288
- Pyosalpinx, 360-362
 - infectiousness of contents, 363, 365
 - rupture of, 368

R

- Radium, combined with Röntgen ray, 716
 - complications following use of, 715
 - distance of effect of, 714
 - dose of, 715
 - effect of filters on, 714
 - upon ovaries, 719
 - fistula following use of, 715
 - histological changes in tissue after use of, 714
 - in abdominal tumors, 723
 - in carcinoma of cervix, 341, 714
 - complicating myomata, 313
 - in early cases, 714
 - of fundus, 346, 717
 - indications for, 717
 - of ovary, 402
 - of urethra, 452
 - of vagina, 197
 - of vulva, 721
- in carcinomata of bladder, 461, 721
 - results of, 721
 - technic of using, 722
- in chorioepithelioma of uterus, 349
- in chronic metritis, 284
- in diseases of rectum, 722
- in hemorrhagic uteri, 720
 - advantages of, 720
 - curettage in, 721
 - results of, 721
- Röntgen ray in conjunction with, 720
 - technic of using, 720
 - varieties influenced by, 720
- in myomata of uterus, 717
 - advantages of, 718
 - complications in, 720
 - contraindications for use of, 718
 - disadvantages of, 717
 - effects of, 717, 719
 - indications for use of, 718
 - results of, 719
 - technic of, 719
- in papillomata of bladder, 721
 - results of, 721
- in pruritus vulva, 723
- in treatment of bladder tumors, 460
- method of use of, 714
- physical properties of, 713
- radiations of, 713
- resistance of tissues to, 713
 - standard of, 713
- Radium, resistance of tumor cells to, 713
 - results of, 714
 - statistics in, 715, 716
- Reaction, Abderhalden, 107
 - complement-fixation for gonorrhœa, 107
 - for syphilis, 108
- Wassermann, 108
- Recto-abdominal examination of pelvic organs, 129
- Rectocele, mode of production of, 202
- Rectum, anatomy of, 45
 - carcinoma of, 534 (*see also* *Carcinoma of Rectum*)
 - diseases of, radium in, 722
 - embryology of, 2
 - examination of, 162
 - by proctoscope, 164
 - by sigmoidoscope, 165
 - by specula, 163
 - irritability of, in extrauterine pregnancy, 85
 - malformations of, 21
 - treatment of, 259
 - polyps of, 533
 - prolapse of, diagnosis of, 532
 - etiology of, 530
 - symptoms of, 531
 - treatment of, 532
 - Moschowitz plan in, 532
 - operations in, 532
 - stricture of, 535
 - tumors of, 534
- Renal, blastema, 6
 - calculus, diagnosis of, 479
 - etiology of, 478
 - pathology of, 478
 - treatment of, 480
 - operations in, 480
 - findings, 110
 - infection, post-operative, etiology of, 689
 - sufficiency, test for, 110
- Resection of Fallopiian tube, 418
 - in gonorrhœal pelvic inflammatory disease, 418
 - technic of, 418
 - of ovary, 404
- Respiration in pelvic disease, 105
- Respiratory symptoms in pelvic disease, 101, 106
- Retarded menstruation, 580
- Retrodisplacements of uterus, 244 (*see also* *Uterus, Displacements of*)
- Retroversion of uterus, 237-244 (*see also* *Uterus, Retroversion of*)
- Reynolds' observations on spermatozoa in diagnosis of sterility, 603
- Ringworm of external genitalia, 166
- Rodent ulcer of vulva, 184
- Röntgen ray, in abdominal tumors, 723
 - in carcinoma of the cervix with radium, 716
 - of the ovary, 402
 - of the vulva, 721
 - in diagnosis of myomata, 309

- Röntgen ray, in diagnosis of vesical calculus, 458
 in examination of the kidney, 151, 152
 of renal calculi, 153, 479
 of ureteral calculus, 156, 491
 in hemorrhagic uteri, 720
 in myomata of uterus, 717
 advantages of, 718
 contraindications to, 718
 disadvantages of, 717
 effects of, 718
 indications for, 718
 in pruritus vulva, 721
 in pyelography, 157
 in treatment of carcinoma of body of uterus; 346
 of menorrhagia, 584
 of metrorrhagia, 585
 of myomata, 310
 of tuberculosis of vulva, 567
 of vulvitis, 171
 in vulvar lesions, 721
 therapy, 713
- Rosenmüller, organ of, 13
- Rosenow's observations on etiology of oöphoritis, 381
- Rupture of ovarian cyst, 407
 of tubal enlargements, 368
 pregnancy, 375
 of uterus, 287
 of varicose veins in broad ligament, 433

S

- Sacroiliac sprain, diagnosis of, 548
 differentiation of, from static backache, 543
 etiology of, 546
 examinations in, 548
 prognosis of, 550
 symptoms of, 547
 treatment of, 548
- Sactosalpinx, 367
- Salpingectomy in pelvic inflammatory disease, 437
- Salpingitis, 359
 and ovarian abscess, 365
 diagnosis, 415 (*see also Pelvic Inflammatory Disease*)
 differential diagnosis from appendicitis, 414
 etiology of, 359
 gonococcus in, 359
 mode of invasion of infecting organism, 359
 relative frequency of infecting organisms, 359
 interstitial, 361
 isthmica nodosa, 361, 418
 pathology, 359
 bilateral involvement, 360
 endosalpingitis, 359, 360
 hydrosalpinx in, 360
 interstitial changes in, 360, 361
- Salpingitis, pathology, perisalpingitis, 360, 361
 pyosalpinx in, 360
 unilateral involvement, 360
 with various infecting organisms, 360
 symptoms (*see Pelvic Inflammatory Disease*)
 treatment (*see Pelvic Inflammatory Disease*)
 tuberculous, 561 (*see also Tuberculosis of Tubes*)
- Salpingo-oöphorectomy for pelvic inflammatory disease, 436
- Salpingostomy, 418, 419
 in pelvic inflammatory disease, 438
- Sänger's operation for cystocele, 216
- Sarcoma of ovary, 396
 of uterus, 346
 of vulva, 183
 radium in, 721
- Schatz pessary, 703
- Selection of cases for operation, 613
 of operations of urgency, 613
 of election, 613
 of patients for operation, 613
 of time of operation in pelvic inflammatory disease, 613
- Serum, auto-therapy, 725
 dose in, 725
 in puerperal inflammatory pelvic disease, 424
 preparation of, 725
 specific, 725
 therapy, 725
- Sexual gland, 1, 42
 maturity, 61
- Shock, post-operative, cause of, 670
 diagnosis of, 670
 symptoms, 670
 treatment of, 670
- Simpson's operation in retroversion, 261
 technic of, 262
- Sims' curette, 121
 position, 115
 speculum, 117
- Skene's ducts, 33
 infection of, 440
 tubules, applications to, 701
- Smear preparations as an aid to diagnosis, 123
- Smith, pessary, 702
- Social state in relation to disease, 91
- Specific therapy in gynecology, 725
- Spermatozoa in diagnosis of sterility, 601-603
- Sphincter ani muscle, divulsion of, for fissure, 523
 lacerations of, 202
 effect of, 202
 repair of complete tear of, 215
- Spinal anæsthesia in pelvic surgery, 652
 Babcock's plan in, 653
 deaths from, 654
 determination of dosage in, 654
 in abdominal operation, 653
 indications for, 652

- Spinal anæsthesia in pelvic surgery, solutions
for, 653
technic of, 653
- Spirochaete pallidum, demonstration of, 124,
174
- Sponges, use of, in abdominal surgery, 648
- Static backache, diagnosis of, 540
recording tracing in, 540
differential diagnosis in, 542
from pelvic disease, 542
from sacroiliac disease, 542, 543
from spinal disease, 543
etiology of, 538
faulty posture in, 539
flat foot in, 538
pelvic disorders in, 538
tumors in, 539
pendulous abdomen in, 539
skeletal defects in, 539
symptoms of, 539
treatment of, general plan of, 543
diet in, 546
orthopaedic, 543
corsets in, 543, 544
exercises in, 546
shoes in, 543
- Sterility, absolute, 598
as symptom of pathologic ante flexion of
uterus, 240
definition of, 598
diagnosis of, 601
examination of male in, 601
Hühner's method in, 601, 602
Reynolds' observations in, 603
spermatozoa in, 601, 602
etiology of, 601
functional defects in, 601
gonococcus infections in, 554, 600
one-child sterility, 598
relative, 598
responsibility of male and female in,
600
treatment of, 603
artificial insemination in, 606
of developmental defects in, 604
of gross pelvic diseases in, 605
of inflammatory diseases of the lower
genital tract in, 604
ovarian transplantation in, 606
posture in, 607
time of coitus in, 607
- Stiles' operation in urinary fistula, 468
- Stitch abscess, 691
- Stomach, acute dilatation of, post-operative,
684
operations on, 515
- Streptococcus, in pelvic inflammatory disease,
411
infection in carcinoma of the cervix, 335
mode of invasion of pelvic organs by, 89,
420
- Stricture of the rectum, diagnosis of, 535
etiology of, 535
pathology of, 535
- Stricture of the rectum, treatment of, 535
of the ureter, diagnosis of, 497
etiology of, 495
pathology of, 496
symptoms of, 495
treatment of, 497
operations in, 497
- of the urethra, diagnosis of, 449
etiology of, 449
symptoms of, 449
treatment of, 449
- Struma ovarii, 399
- Subinvolution of uterus, etiology of, 285
symptoms of, 285
treatment of, 285
- Suburethral abscess, 445
- Support of perineum, normal, mechanics of,
200
- Suppression of urine from ureteral obstruc-
tion, post-operative, 685
- Suppuration, of incision, post-operative, 691
in pelvis, post-operative, 691
etiology of, 691
treatment of, 692
- Suprarenal gland, in relation to genital or-
gans, 64
glands, relationship of, to generative or-
gans, 64
tumors, 481
- Suspension of kidney, 482, 483
- Symptomatology, 91
circulatory disorders in, 101
constipation in, 100
gastro-intestinal disorders in, 100
general health in, 101
headache in, 99
leucorrhœa in, 99
menstruation in, 98
nervous manifestations in, 101
pain in, 97
- Syncytium, 73
- Syphilis, in chronic metritis, 282
in myomata, 292
of the cervix, 572
differential diagnosis of from,
aphthous ulcers, 577
carcinoma of cervix, 577
chancroid, 576
gonorrhœal macules, 576
herpes genitalis, 577
myomata, 577
tuberculous ulcers, 576
primary lesion in, 572
secondary lesion in, 573
tertiary lesion in, 573
- of the Fallopian tube, 574
- of the generative organs, 569
diagnosis of, 575
factors in difficulty in establish-
ing diagnosis, 569
general considerations of, 569
mode of infection, 569
pathological findings in, 569, 570
prognosis of, 578

Syphilis of the generative organs, symptoms of, 569
 treatment of, 578
 of the ovary, 574
 of the pelvic cellular tissue, 575
 of the uterus, 574
 of the vagina, 572
 of the vulva, 174, 571
 primary lesion in, 174, 571
 varieties of, 571
 secondary lesion in, 174, 571
 condylomata lata, 571
 varieties of, 571
 tertiary lesions in, 571
 gumma in, 571
 organism of, demonstration of, 124

T

Temperature in pelvic disease, 103
 Thermo-cautery, 704
 Thrombophlebitis, placental, 420
 Thyroid tissue in ovary, 399
 gland, relationship of, to generative organs, 64
 Time of getting out of bed after operations, 669
 Trachelectomy, 234
 indications for, 232
 Trachelorrhaphy of Emmet, 233
 indication for, 232
 Transplantation of ovaries, 606
 Treatment of patients preparatory to operation, 614
 Trendelenburg position, 669
 Treponema pallidum, demonstration of, 124
 Triangular ligament of pelvic floor, 53
 Trimanual method of percussion, 130
 Toxic arthritis, 550
 Tuberculosis, of cervix, 566
 of the endometrium, 564
 of the generative organs, 89, 560
 manifestations of, 560
 primary, 560
 relative frequency of, 560
 secondary, 560
 site of, relative frequency of, 560
 of the kidney, 473
 diagnosis of, 475
 animal inoculations in, 475
 etiology of, 473
 pathology of, 473
 prognosis of, 478
 symptoms of, 475
 cystoscopy in, 457, 476
 urine in, 476
 treatment of, 477
 operations in, 478
 of the ovary, pathology of, 565
 symptoms of, 565, 566
 treatment of, 566
 of the peritoneum, etiology of, 563
 pathology of, 563
 varieties of, 563
 symptoms of, 563

Syphilis of the peritoneum, treatment of, 564
 of the tubes, diagnosis of, 562
 pathology of, primary form of, 561
 secondary form of, 561
 symptoms of, 562
 ascites in, 562
 treatment of, 562
 of the vagina, 566
 of the vulva, diagnosis of, 567
 differential diagnosis of, 567
 from chancroid, 567
 from carcinoma, 567
 from syphilis, 567
 pathology of, 567
 symptoms of, 567
 treatment of, 567
 Tubo-ovarian abscess, 365
 cyst, 366, 367
 Tubules, Kobelt's, 11
 paraurethral, 34
 Pflüger's, 385
 Skene's, 700
 Tunica albuginea, 1
 Tympanites, post-operative, 674
 treatment of, 674

U

Urachus, cyst of, 21
 Urea, in blood, method of determining, 160
 Ureter, anatomy of, 43
 calculus in, 489
 diagnosis of, 156
 shadow catheter in, 156
 catheterization of, 147
 by direct method, 148
 by indirect method, 148
 in pyelitis, 487
 reflex anuria in, 150
 collection of urine from, 149
 diseases of, 469
 displacements of, 147
 embryology of, 3
 examination of, by wax-tipped bougie, 150
 inflammation of, 489
 in hysterectomy, 324
 injuries to, 642
 inspection of orifice of, 142
 ligation of, 643
 malformations of, 21
 absence of, 21
 duplication of, 21
 fistula of, 21
 occlusion of, 21
 obstruction of, 149, 497, 686
 suppression of urine by, 686
 symptoms of, 498
 treatment of, 498
 orifices of, position of, 147
 locating by chromo-ureterocystoscopy, 159
 palpation of, 138
 physiology of, 84

- Ureter, relation of, to uterine artery, 44
 stone in, 489
 stricture of, 495 (*see also Stricture of Ureter*)
- Ureteral, calculus, diagnosis of, 490
 methods in, 490
 differential diagnosis of, from appendicitis, 490
 etiology of, 489
 pathology of, 489
 sequelæ of, 490
 symptoms of, 490
 treatment of, 492
 operations in, 493
 extraperitoneal, 495
 for stone at pelvic brim, 493
 in the intraparietal ureter, 494
 in upper ureter, 493
 in vesical portion, 493
 per vaginam, 495
- catheters, sterilization of, 143
 bismuth, 156
 shadow, 156
- colic, 490
 differentiation of, from appendicitis, 490
 treatment, 492
- obstruction, post-operative, 686
 stricture, 495
 anastomosis in, 468
- Ureteritis, diagnosis of, 489
 symptoms, 489
 treatment, 487, 489
- Uretero-rectal anastomosis in urinary fistula, 468
- Uretero-ureteral anastomosis in urinary fistula, 468
- Uretero-vaginal fistula, 463
- Urethra, abscess of, 445
 anatomy of, 43
 application to, 700
 carcinoma of, 451
 caruncle of, 449
 developmental anomalies of, 21
 dilatation of, 447
 diseases of, 440
 embryology of, 2
 fissure of, 445
 inflammation of, 440
 inspection of, 140
 local anæsthesia for, 650
 mucosa of, prolapse of, 446
 new growths of, 451
 palpation of, 138
 physiology of, 84
 stricture of, 449
- Urethral caruncle, diagnosis of, 449
 symptoms of, 449
 treatment of, 450
- dilatation, diagnosis of, 448
 etiology of, 447
 symptoms of, 448
 treatment of, 448
- Urethral dilatation, treatment of, operations in, 449
- Urethritis, acute gonorrhœal, 440
 diagnosis of, 440
 prognosis of, 440
 symptoms of, 440
 treatment of, 440
 types of, 441
- chronic gonorrhœal, 441
 diagnosis of, 442
 local treatment in, 443
 symptoms of, 442
 treatment of, 443
 types of, 444
- Urethroscopy, 140
- Urethro-vaginal fistula, 463
- Urinalysis, 108, 138
- Urinary, fistula, diagnosis of, 465
 etiology of, 463
 prognosis of, 465
 symptoms of, 463
 treatment of, 466
 extraperitoneal abdominal, 468
 nephrectomy in, 468
 operations in, 466
 vaginal operations in, 467
 Ward's plan in, 466
 varieties, 463
 organs, examination of, 138
 symptoms in pelvic disease, 100
- Urination, mechanics of, 84
- Urine, bacteria of, 109
 bacteriologic examination of, 100
 collection of, from ureters, 149
 examination of, for tubercle bacillus, 111
 incontinence of, 447, 448
 in pelvic disease, 108
- Uterus, abscess of, 282
 adenomyoma of, 326 (*see also Adenomyomata of Uterus*)
 anatomy of, 36
 antelexion of, 237
 anteposition of, 273
 at birth, 8
 carcinoma of, 330 (*see also Carcinoma of Uterus*)
 changes in form of, 237
 in position of, 237
 chorioepithelioma of, 346 (*see also Chorioepithelioma of Uterus*)
 descensus of, 238, 263
 accompanying lesions, 266
 diagnosis of, 268
 etiology of, 265
 mechanics of, 263
 symptoms of, 268
 treatment of, 268
 by pessaries, 269
 Menge pessary in, 270
 operations in, 270
 developmental anomalies of, 15, 18, 25, 288
 bicornis, 17
 congenital dwarfing, 17
 duplex bicornis, 16, 26

Uterus, developmental anomalies of, duplex
 septus, 17
 subseptus, 17
 fœtalis, 17
 infantilis, 18
 latero-position, 18
 retroflexion, 18
 retroversion, 18
 unicornis, 16
 during childhood, 8
 elevation of, 238, 273
 embryology, 2
 exploration of, in puerperal pelvic inflammatory disease, 423
 with sound, 19
 gas in, 288 (*see also* *Physometra*)
 hypoplasia of, 240
 hernia of, 238
 hyperinvolution of, 286 (*see also* *Hyperinvolution of Uterus*)
 inflammation of, acute, 282
 chronic, 282
 interposition of, for cystocele, 220
 inversion of, 274
 latero-position of, 237, 273
 ligaments of, 46
 lymphatics of, 60
 malformations of, 25
 diagnosis of, 25
 didelphys, 26
 treatment of, 28
 malignant tumors of, 330
 myomata of, 292 (*see also* *Myomata of Uterus*)
 normal position of, 237
 pathologic ante flexion of, associated conditions with, 239
 diagnosis of, 241
 Dudley's operation for, 243
 Norris drain in, 243
 Pozzi's operation in, 243
 prognosis of, 241
 symptoms of, 240
 treatment of, 242
 varieties of, 239
 flexion of, 237
 position of, 237
 perforation of, 287 (*see also* *Perforation of Uterus*)
 precancerous changes in, 343
 prolapse of, 238, 263 (*see also* *Descensus of Uterus*)
 treatment of, 268
 by pessaries, 269
 cervix, attention to, in, 271
 choice of operations in, 270
 interposition operation, 272
 Menge pessary in, 270
 operations in, 270
 supravaginal hysterectomy in, 273
 vaginal fixation in, 272
 ventral fixation in, 271
 physiology of, 63

Uterus, procidentia of, 238, 266 (*see also* *Descensus of Uterus*)
 pus in, 238 (*see also* *Pyometra*)
 retroflexion of, 237, 244 (*see also* *Retroversion of Uterus*)
 retroposition of, 273
 retroversio flexion of (*see also* *Retroversion*)
 retroversion of, 244
 causes of, 244
 diagnosis of, 247
 in pregnancy, 253, 657
 treatment of, 253, 659
 mechanics of production of, 203
 symptoms of, 246
 treatment of, 247
 Alexander operation in, 254, 260
 Coffey operation, 258, 261
 knee-chest position in, 250
 manual replacement of, 249
 operations in, 254
 test of, 258
 pessaries in, 250-253
 replacement of uterus in, 248
 round ligament operations in, 258
 shortening of utero-sacral ligaments in, 263
 Simpson operation in, 261
 uterosacral ligaments in, 263
 ventrofixation in, 261
 ventrosuspension in, 257, 260
 Webster-Baldy operation in, 259, 262
 varieties of, 244
 sarcoma of, 346
 subinvolution of, 285
 syphilis of, 574
 torsion of, 274
 Uterine, intra-, digital palpation, 119
 pack, 705
 sound, 119
 Utero-vaginal tract, congenital dwarfing of, 17

V

Vaccine therapy, dosage in, 726
 gonococcus, 725
 in arthritis, 726
 in leucorrhœa, 199
 in pelvic inflammatory disease, 725
 in puerperal pelvic inflammatory disease, 425
 in pyelitis, 488
 in vaginitis of infants, 725
 in vulvo-vaginitis, 725
 mixed, 725
 reactions to, 726
 diagnostic value of, 726
 Vagina, anatomy of, 34
 artificial formation of, 28
 at birth, 8
 bacteriology of, 89
 Baldwin's operation on, 28
 carcinoma of, 196
 chorioepithelioma of, 197

Vagina, cysts of, 194
 developmental anomalies of, 25
 absence of, 18
 atresia of, 18
 defectus vagina, 18
 double, 18, 26
 septate, 19
 unilateral, 18
 diseases of, 192
 embryology of, 2
 fibromyoma of, 195
 foreign bodies in, 197
 inflammation of, 192
 local applications to, 699
 lymphatics of, 60
 malformations of, 25
 diagnosis of, 25
 physiology of, 62
 sarcoma of, 196
 grape-like, 196
 syphilis of, 572
 tuberculosis of, 566
 Vaginal, douche, indications for, 706
 method of giving, 707
 solutions for, 707
 drainage, 659
 examination of pelvic organs, 126
 fixation for descensus and prolapsus of
 uterus, 272
 incision and drainage, 659
 local anæsthesia for, 651
 operations in urinary fistula, 467
 pack, 705
 puncture, in extrauterine pregnancy, 379,
 659
 in gonorrhœal pelvic inflammatory
 disease, 416, 438
 in pelvic abscess, 428
 in puerperal pelvic inflammatory dis-
 ease, 425
 technic of, 427
 tampon, medicaments for, 709
 in chronic pelvic cellulitis, 433
 methods of using, 709
 uses of, 708
 vaults, 34
 Vaginismus, 172, 194
 treatment of, 194
 Vaginitis, 192
 acute, 192
 chronic, 192
 gonorrhœal, 193
 senile, 193
 subacute, 192
 symptoms, 192
 treatment, 192, 193
 by lactic acid, 198
 Van Hook's method of ureteral anastomosis,
 492
 Varicose veins of broad ligament, rupture of,
 433
 of vulva, 180
 Venereal sores, 173
 warts, 178

Ventrofixation of uterus, in retroversion, 261
 Ventrosuspension in retroversion, 257, 260
 Vesical calculus, diagnosis of, 458
 etiology of, 458
 Röntgen ray in, 458
 symptoms of, 458
 treatment of, 459
 operation in, 459
 vesico-vaginal fistula, 459
 Vesico-cervical fistula, 463
 Vesico-vaginal fistula, 463
 in cystitis, 456
 in treatment of vesical calculus, 459
 Vestibule, 33
 Vicarious menstruation, 580
 Virgins, examination of, 112, 610
 Visceroptosis, associated with prolapse of
 uterus, 265
 Vulva, adhesions of, 167
 anatomy of, 31
 atresia of, 20
 carcinoma of, 181
 chancro of, 174
 chancroid of, 176
 condylomata of, 178
 developmental anomalies of, 20
 double, 20
 elephantiasis of, 173
 fibromyoma of, 185
 gonorrhœal inflammation of, 169
 hæmatoma of, 180
 hyperæsthesia of, 172
 hypertrophy of, 180
 infantile, 20
 inflammation of, 167
 kraurosis of, 172
 lipoma of, 186
 lupus of, 183
 lymphatics of, 60
 œdema of, 179
 pruritis of, 169
 radium in, 722
 rodent ulcer, 184
 sarcoma of, 183
 sebaceous cysts of, 186
 syphilis of, 571
 syphilitic eruptions on, 174, 175
 tuberculosis of, 183, 567
 varicose veins of, 180

Vulvar, incisions, local anæsthesia in, 652
 Vulvectomy, 182
 Vulvitis, 167
 Vulvo-vaginitis, of children, treatment of, 169
 vaccines in, 169
 gonorrhœal, 169
 treatment of, 169
 Vulvo-vaginal glands, abscess of, 186
 treatment of, 186, 187
 cysts of, 187
 inflammation of, 186

W

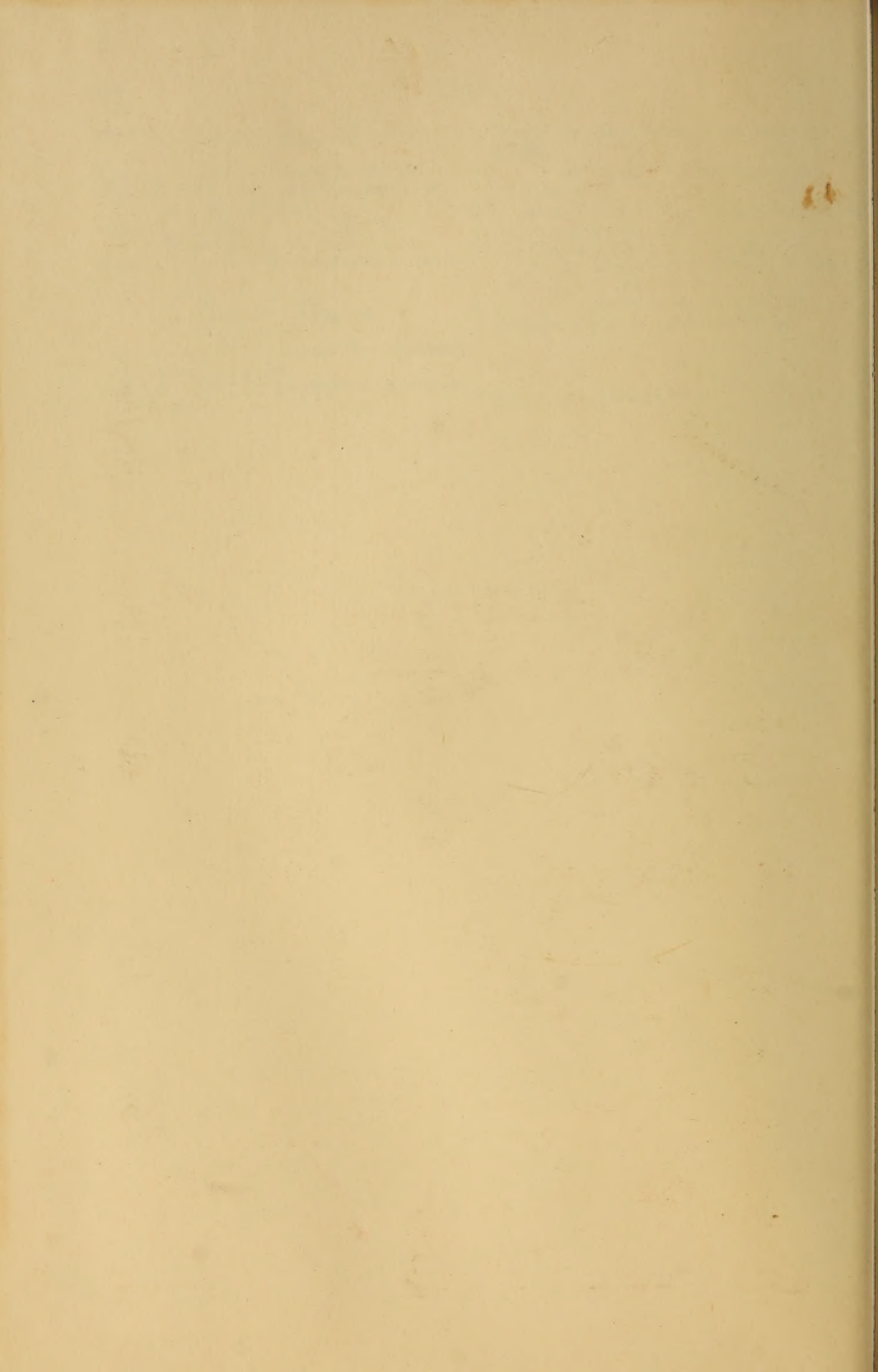
Waldeyer's theory of histogenesis of ovarian
 cysts, 384

EW

- Walthard's theory of histogenesis of ovarian cysts, 384
Ward's operation in urinary fistula, 466
Wassermann reaction, in pelvic disease, 107
 in vulvar diseases, 174
Watkins' operation for cystocele, 220
 in prolapse of the uterus, 272
Webster's operation in retroversion of uterus, 259
 hæmostasis in, 640
 in prolapse of uterus, 410
 technic of, 262
Wertheim's panhysterectomy for malignant disease of uterus, 349
Williams' theory of histogenesis of ovarian cysts, 384
Wilms' operation for intestinal stasis, 516
Wolffian body, 1
 in etiology of adenomyoma, 327
 duct, 1
 glomeruli, in etiology of pseudomucinous cysts of the ovary, 388
 tubules, in ovarian cysts, 384
 in etiology of carcinoma of ovary, 395
 of paraovarian cysts, 391
Wounds of viscera, treatment of, 642

X

X-ray (*see Röntgen Ray*)



LIBRARY OF CONGRESS



0 022 216 093 5